The Empire Cotton Growing Review

Journal of the Empire Cotton Growing Corporation

Vol. XIX
No. 1

June
1942

Abstract Number

Published by
P. S. King & Staples, Ltd., 14, Great Smith St., London, S.W.1
for the Empire Cotton Growing Corporation
PRICE: 1s. 3d. post free.

THE EMPIRE COTTON GROWING CORPORATION undertake no responsibility for opinions expressed, or recommendations made, in any article or extract in this Journal.

Communications for the Journal should be sent in duplicate and addressed:

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9 Kingsmere Road,

Wimbledon Common,

London, S.W.19

BACK NUMBERS OF THE REVIEW

Vols I (1924) to XIV. (1937) inclusive. A few numbers are still available at a cost of 1s. 6d. per copy.

THE EMPIRE COTTON GROWING REVIEW

ABSTRACT NUMBER

VOL. XIX. JUNE, 1942. No. 1

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. INDIAN COTTON: REVIEW OF THE 1940-41 SEASON. We have received from Messrs. Chunilal Mehta & Co., Bombay, a copy of their *Indian Cotton Review for the 1940-41 Season.* The area under cotton totalled 22,902,000 acres, compared with 21,580,000 acres in the previous season. Production was estimated at 5,785,000 bales of 400 lb. against 4,909,000 bales during 1939-40. The yield per acre was 101 lb., compared with the figure for 1939-40 of 91 lb. per acre. The crop, on the whole, made very favourable progress during the growing season. Exports totalled 2,097,000 bales, a decline of about 12 per cent. from the previous season's total of 2,381,000 bales. Consumption of Indian cotton by mills in India during the year constituted an all-time record at 3,580,000 bales, compared with 3,019,000 bales for 1939-40. An interesting section of the Review under the title of " Looking Ahead " deals with the prospective position of Indian cotton during the 1941-42 season.

The usual statistical tables are included in the report, dealing with cotton acreage; production; world supply, distribution and stocks of Indian cotton; consumption by mills in India; Bombay cotton prices, etc.

2. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1940-41 SEASON (*Stat. Leaflt. No.* 1, 1941. Ind. Cent. Cott. Comm.) The crop of 1940-41 is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	107,000
Medium staple, $\frac{7}{8}$ to 1 inch	1,971,000
Short staple, below $\frac{7}{8}$ inch	3,707,000
Grand total	5,785,000

3. INDIA: COTTON IMPORT DUTY. (*Cotton*, M/c., 31/1/42, p. 1.) It is stated that the Government of India has imposed an additional import duty of 1 anna per lb. on raw cotton. The proceeds of this will be credited to a special fund to be utilized for the financing of measures to benefit growers of short-staple cotton in India. This follows the announcement that the Government was taking immediate steps to steady the cotton market by purchasing lower grades of cotton previously exported to Japan, and will also finance measures designed to assist cultivators to change over from short-staple cotton to crops more useful in present circumstances.

4. INDIA: ADVISORY PANEL FOR THE COTTON TEXTILE INDUSTRY. (*Cotton*, M/c., 31/1/42, p. 5.) The constitution of an Advisory Panel of the cotton textile industry has been officially announced. It consists of two representatives each of the Millowners' Associations of Bombay, Calcutta, and South India, and of the Upper India Chamber of Commerce, Cawnpore, and one representative each of the Millowners' Associations of Bengal, Baroda and Indore. The panel will be summoned from time to time by the Directorate-General of Supply, and will advise on matters relating to the demands on the textile industry caused by the war, the best methods of speeding up production, the allocation of war supply orders to the various units of the industry, and the principles on which prices should be fixed.

5. INDIAN CENTRAL COTTON COMMITTEE. (*Curr. Sci.*, **10**, 1941, p. 93. From *Pl. Bre. Abstrs.*, xi., **4**, 1941, p. 257.) According to this brief report of the Second Conference of Scientific Research Workers on Cotton, held in Bombay, January 19-21, 1941, cotton breeding figured largely in the discussions. The need for a complete survey of cottons in Eastern Bengal, Assam and Burma and for a more intensive programme of hybridization was urged. Interest was shown in the Asiatic-American crosses being studied at Surat. The view was expressed that a very prolific, very short-stapled cotton would under present conditions command a limited market. The Technological Laboratory has advanced the percentage of the variation in spinning performance which can be accounted for in terms of fibre properties from 86 to 89 per cent. by taking into account fibre length, fibre weight per inch and swollen hair diameter. The problem of breeding a completely wilt-resistant cotton was discussed. Encouraging results from a technique worked out at Poona were reported, and the desirability of co-operation between different specialists was emphasized.

6. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1940-41. (Ind. Cent. Cott. Comm., 1941. Price 6 annas.) A report of increased progress in all sections of the Laboratory. The total number of samples tested reached the record figure of 1,800, compared with 768 for the previous season, which also constituted a record. The work at the Testing House made remarkable progress, 1,120 samples being tested there, against 304 in 1939-40. The Spinning Laboratory, Technological Research and Moisture Testing Sections were all fairly occupied during the year. A noteworthy event during the period under review was the inauguration of a new Ginning Section which made it possible to carry out ginning tests with various speeds, settings, etc., on different varieties of Indian cottons.

During the season 3 bulletins and 36 circulars were issued, and in addition 2 papers were contributed to be read at the 2nd Conference of Scientific Research Workers on Cotton in India held in Bombay in January, 1941. Summaries of these publications are included in the Report.

7. IMPROVEMENT IN INDIAN COTTON. (*Ind. Farming*, July, 1941, pp. 376-382.)

Medium-Stapled Cotton in Bombay. By B. S. Patel. (p. 376.) At the cotton-breeding station at Jalgaon in Bombay Province, selection work in the Verum strains has resulted in a wilt-resistant strain, Jarila, which is far superior to the local NR cotton. It has white, shining lint of $\frac{7}{8}$-in. staple, and spins 30 counts against 7 counts for NR. Arrangements have been made through approved agents and co-operative societies to stock pure Jarila seed sufficient for 150,000 acres, and to organize 49,000 acres seed area in different stages during the coming season.

Cotton Research in the United Provinces. By C. M. Das. (p. 379.) A scheme, financed by the Indian Central Cotton Committee, for the improvement of

Bengal cottons is being carried out. Hybridization work in progress comprises the crossing of three improved varieties of United Provinces cottons, C520, C402, and Perso-American with other standard types obtained from outside the province.

Cotton in Mysore. By M. Vasudevamurthy. (p. 382.) A concentrated scheme of cotton cultivation has been launched in the Maddur and Malavalli talukas, the tracts fod by the distributaries of the Irwin Canal. Experiments have indicated that the red loamy soils are specially well suited to long-stapled cotton, and these cottons do particularly well under irrigation and meet the requirements of the mills in Mysore.

8. The Indian Journal of Genetics and Plant Breeding. See Abstr. 214 in this issue of the Review.

9. Plant Breeding and Genetical Work in India. By K. Ramiah. See Abstr. 216 in this issue of the Review.

10. Indian Central Textile Research Laboratory: Plea for Establishment. By J. V. Saraiya. (*Ind. Text. J.*, **52**, 1941, p. 32. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 55.) The writer points out that, as a result of the war, the Indian textile industry has gained from the placing of large Government orders and the cutting off of Japanese competition in home and other markets, and suggests that some of the profits should be devoted to the establishment of a Central Textile Research Laboratory for the development of methods of increasing the technical efficiency of the mill industry and making it independent of foreign imports, such as machinery, spare parts, bleaching materials, dyes, etc., so as to ensure its survival in the post-war period. The work of the Technological Laboratory, run by the Indian Central Cotton Committee, does not extend to the production of machinery, dyes, etc. In Bombay Presidency, which in 1939 had 6,016,297 spindles and 73,705 looms against 10,059,370 spindles and 202,469 looms in the whole of India, there are only two important institutions that give special training in textile subjects and carry out research connected with the industry. Accommodation in these institutions is limited, and there is great demand for the trained men. There is at present great scope in India for starting the feeder lines of the industry such as the manufacture of dyes, bleaching agents, machinery, etc., but private enterprise is discouraged by the lack of institutions to carry out preliminary research work.

11. Scientific Reports of the Imperial Agricultural Research Institute, New Delhi, 1939-40. (Manager of Pubns., Delhi, 1941. Price Rs. 2-6, or 4s.) A report of steady progress in the research work carried out during the season in the different branches of agricultural science. Cotton is not included.

12. Industrial Development in India. By S. Lall. (*Text. Mnfr.*, lxvii., **795**, 1941, p. 100.) Encouragement of Indian industrialization includes the hand-loom industries. So far as hand-spinning is concerned, the cottage worker is unable to hold his own against the mills, and his remuneration is so small that even as a spare-time occupation it is of little material value. The position is otherwise with the hand-loom weaving industry. This has shown astonishing vitality in face of severe competition from the mills. In 1913-14 60 per cent. of the total consumption of cotton piecegoods in India was imported, 20 per cent. was supplied by Indian mills, and 20 per cent. by hand-loom production. The corresponding percentages in 1936-37 were 13 per cent. imported, 61 per cent. by Indian mills, and 26 per cent. by hand-loom. Thus the expansion of the Indian mills has been at the expense of foreign mills and not of the indigenous hand-loom industry. This cottage industry requires little capital and the overhead expenses are negligible. It is better suited than the mills to meet a

local demand for a particular style or design of cloth—for instance, the complex Sambalpur saris. The hand-loom worker can produce individual designs, whereas the mills can only manufacture to a standard pattern.

13. INDIAN HAND-LOOM WEAVERS. (*Cotton*, M/c., 13/12/41, p. 5.) The war has given an impetus not only to the mill industry in India, but also to the hand-loom industry. Orders so far placed since the outbreak of hostilities for hand-loom blankets have already passed the impressive total of 1,000,000 of the approximate value of Rs. 70,000,000 to Rs. 75,00,000. The cottage industries are also engaged in weaving a fairly wide range of articles such as webbing, tapes, durries, cordage, etc., for which there are considerable war demands.

14. INDIAN COTTON: NEW USES. By N. Ahmad. (*Ind. Text. J. Jubilee Souvenir*, 1890-1940, issued 1941. From *Summ. Curr. Lit.*, xxii., **4**, 1942, p. 86.) The spinning capacity of Indian cottons is reported as an introduction to a discussion of the problem of disposing of an annual surplus of some 1½ to 2 million bales of short cotton, and the author advocates a programme of increasing the uses of cotton for other than clothing and household purposes. The work of United States authorities on such lines is discussed.

15. SECRET BIDDING IN THE COTTON TRADE. By P. L. Tandon and F. Haq. (*Ind. Frmg.*, October, 1941, p. 518.) Describes the "cover" system of bargaining in cotton obtaining in the Punjab and in some of the cotton markets of the Central Provinces and Berar.

16. THE DESERT EDGE OF INDIAN AGRICULTURE. By Dr. W. Burns. (*Ind. Frmg.*, October, 1941, p. 509.) An article dealing in the main with the problems and potentialities of agriculture in the dry areas of Rajputana and the adjoining and comparable parts of Sind and the Punjab. The various sections are headed: Dry Farming; Scope for Tractor Cultivation; What to Grow; Importance of Earliness; Grassland Management; Fodder Trees; Subsoil Irrigation; Need for a Desert Laboratory.

17. SONS OF THE SOIL. By Dr. W. Burns. (Manager of Pubns., Civil Lines, Delhi. Price Rs. 2-6, or 4s. From *Ind. Agr. J.*, xi., **4**, 1941, p. iii.) The object of this book is to show the variety of individuals and classes who cultivate the soil of India. There are many publications for those who desire rows of figures or discussions of rural economics; these sketches attempt no competition with such books, but aim at giving the idea of the cultivator as a man, and not as an economic unit. It is hoped that they may be of use in many ways, and perhaps, not least, in letting one half of India know how the other half lives.

18. MADRAS: COTTON RESEARCH, 1939-40. (*Rpt. Operns. Dpt. Agr. Madras*, 1939-40.) One hundred and fourteen American varieties imported from different countries were tried out at the Coimbatore Cotton Breeding Station, but all proved susceptible to jassid and unsuited to local conditions. Those with the best lint length and earliness were, however, used for crossing with Co.2. The progenies of the crosses between the two strains X3915 and X4383 were more promising. The lint of X3915 was stated by the Director, Technological Laboratory, Bombay, to be suitable for spinning 50's. It fetched a premium of Rs. 25 per 784 lb. over that of Cambodia, and growers consider that its introduction will benefit them to the extent of Rs. 25 per acre when raised as a summer crop. The performances of strain 920 over the past five years were found to average Rs. 8 per acre more than Co.2, in spite of its shorter and coarser lint. In work on the improvement of indigenous cottons K.1 still retained its superiority over other strains. A new fully fertile tetraploid cotton was obtained by treating with colchicine a partially fertile cross between Karunganni and an

African wild cotton. It was found to possess finer lint than Karunganni and to cross freely with American varieties, and should prove useful for black soil tracts.

19. MYSORE: COTTON CULTIVATION. (*Mysore Agr. Cal.*, 1941-42.) The cultivation of Mysore-American cottons (M.A. II.) in areas never previously cropped to cotton met with success. This strain has fine lint, high yield, and great resistance to red leaf blight, and it is rapidly replacing the Local Doddahathi and Gadag No. I. In the black cotton soil area, improved Sannahathi (Asiatic) varieties introduced were H. 190, Sel 69 and C.N. 86. Strains 199 and 260-61 are under multiplication for release to cultivators during the next season.

20. MYSORE COTTONS AND THEIR IMPROVEMENT. By V. N. Ranganatha Rao. (*Mysore Agr. and Exp. Union Jour.*, **18**, 2, 1939, p. 57. From *Cott. Lit.*, July, 1941, p. 264.) Concerns two new strains of cotton possessing red flower and green seed developed from interspecific hybridization between *G. arboreum* and *G. herbaceum*.

21. A STUDY OF FORECASTING OF THE COTTON CROP IN THE PUNJAB. By R. S. Koshal. (*Ind. J. Agr. Sci.*, xi., **3**, 1941, p. 374.) Examination of the forecasts of the cotton crop in the Punjab for several seasons showed them to be recurring under-estimates, and a revision of standard yield figures became necessary. An extensive statistical examination was undertaken of all the crop-cutting experiments and other data for the period 1932-37 in order to evolve a suitable method for determining the average yield of both irrigated and unirrigated *desi* and American cottons for each district. As a result of the investigation new standard yield figures are given representing the average production in lb. of lint per acre for each district and type of cotton. They are considerably higher than the old figures, the provincial standard yields for *desi* and American cotton being raised from 123 and 130 lb. to 193 and 195 lb. respectively. The revised district yields will be a guide for future forecasts, and it is hoped that the dangers of under-estimation will be reduced.

22. SOME IRRIGATION PROBLEMS IN THE PUNJAB. By E. McKenzie Taylor and M. L. Mehta. (*Ind. J. Agr. Sci.*, xi., **2**, 1941, p. 137.) The various sections of this paper deal with the following: The rivers of the Punjab and their associated irrigation systems; the construction and maintenance of canal systems; the rise of the water-table and water-logging; the deterioration of the land due to the accumulation of sodium salts; tube wells; distribution of irrigation water and the method of assessment; rainfall, run-off and soil erosion.

Diagrams illustrate the effects on salt distribution in the profile resulting from the introduction of irrigation and the growth of cotton and rice. In the case of cotton it will be seen that irrigation has caused a redistribution of salts originally present in the soil crust. A zone of salt accumulation has been formed similar to that which had been shown to be present in the normal irrigated areas. In the case of rice no zone of accumulation has been formed, but the salt appears to have been washed completely from the soil crust into the underlying sand layer. These observations have important applications to both the prevention of land deterioration and its reclamation. Having established that a zone of salt accumulation was formed under cotton irrigation, the subsequent history of this zone with different crops was studied. It has been established that if the irrigation water supplied is sufficient to moisten the soil to the depth of the zone of salt accumulation, but is insufficient to balance that lost by transpiration and evaporation, then the tendency is for the zone of salt accumulation to move towards the surface. If the amount of irrigation water is sufficient to counterbalance the losses due to transpiration and evaporation, then the zone of

accumulation of salt remains stationary or moves in a downward direction. It seems, therefore, that in the Punjab it is necessary to study not only the water requirements of the crops, but also the water requirements of the soil with respect to the possibility of deterioration.

23. SIND: COTTON REGULATION. (*Cotton*, M/c., 29/11/41, p. 6.) To prevent admixture of a superior variety of cotton with inferior strains and to stimulate cultivation of American long-staple cotton as "money crop," for which Sind is particularly suited, the Government propose to regulate the cultivation of cotton. As a first step the Government contemplate bringing forward a Bill seeking to restrict the area under *desi* cotton to certain tracts only, particularly in Nawabshah district and a division in Thar-Parkar.

24. UNITED PROVINCES: COTTON RESEARCH, 1939-40. (*Ann. Admin. Rpt. of Dpt. Agr., Un. Prov.*, 1939-40, recently received.) "The work during the year included a collection and study of indigenous cottons, selection and breeding work, irradiation response studies, varietal and agronomical tests, rotational and growth studies, wilt resistance, spacing effect on pink bollworm incidence, and sowing time and environmental effects on spinning quality. In the selection and breeding part of the work, examination, purification, and replicated trials continue on the material derived from the original field survey collections. . . . Under cultivators' conditions as in the past, C. 402, C. 520 and Perso-American cottons were tested against the local cotton. The results in general indicated the superiority of C. 520 and Perso-American over all others. C. 402 gave the poorest performance."

25. A NOTE ON THE CULTIVATION OF IMPROVED VARIETIES OF COTTON IN THE UNITED PROVINCES. By B. L. Sethi. (*Bull. Dpt. Agr., U.P.*, **84**, 1941, p. 5. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 257.) Accounts are given of the two improved cotton varieties, C. 520 and Perso-American, which have been produced by the Department. C. 520 (*G. arboreum*) was extracted from the indigenous cottons of Saharanpur. It is characterized by early maturity, hardiness to withstand adverse weather conditions, and high yielding capacity. It has a ginning outturn of 38 per cent. and a staple length of 11/16 to 13/16 inch. Perso-American (*G. hirsutum*) is a selection from American types imported from Persia by the Department. In quality the variety is definitely superior to C. 520, and it yields at least as much as that cotton. It has a ginning outturn of 32 per cent. and a staple length of 28/32 inch.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

26. AGRICULTURAL MARKETING IN THE COLONIAL EMPIRE. By H. A. Tempany. (*Emp. J. of Exp. Agr.*, x., **37**, 1942, p. 1.) The prosperity of the agriculturist and his progress in efficiency depend to a large extent on the marketing of his produce. The outbreak of war emphasized the importance of marketing problems in the Colonial Dependencies, particularly in regard to foodstuffs, since the stimulus given to increased local production was unlikely to be effective unless adequate marketing arrangements existed. To ascertain directions in which further efforts to improve matters might be desirable, information concerning agricultural marketing conditions in the Dependencies was collected in 1940 on the initiative of Sir Frank Stockdale, from which a detailed survey of the position was made, but the publication of this survey had to be postponed until after the war. In the present paper, Dr. Tempany, who succeeded Sir Frank Stockdale as Agricultural Adviser at the Colonial Office, has given an account of the more important features of the position.

Dr. Tempany points out that there has been marked progress in the organization of agricultural marketing in the Colonial Dependencies of recent years, but

efforts have been mainly concentrated on products for export; local marketing has been somewhat neglected, and greater attention should be paid to this aspect of the question. The most far-reaching developments are the international regulation schemes for rubber, tea, and sugar, which are designed to stabilize market prices by adjusting production to demand, and from their success it would appear not improbable that in due course the principle of controlled production may be extended to other commodities. War conditions have perforce brought about great changes in the marketing of many colonial products: the demands of the military situation, food requirements in the United Kingdom and elsewhere, the supply of war materials, and the shipping position have necessitated Government intervention on the grand scale, and the control of production, transport and marketing of the majority of agricultural commodities, together with a large measure of price control. A considerable relaxation of these measures must occur when peace is resumed, but the experience gained in connection with them may lead to far-reaching modifications of marketing systems in the post-war period.

Dr. Tempany then reviews the main features of the marketing position, as it existed prior to the outbreak of war, in the West African Dependencies, East Africa, Eastern Dependencies, West Indies, Mediterranean Dependencies, and the Western Pacific and Atlantic.

In the general summary following the author refers to the marketing of smallholders' produce, and points out that frequently this has achieved greater organization in industries which require elaborate processing of the produce before export—*e.g.*, in the sugar and cotton industries—necessitating the erection of factories. On the other hand, where the smallholder turns out produce ready for export—*e.g.*, cocoa, rubber, or tobacco—the situation is more difficult, and sales tend to remain in the hands of the middlemen buyers. In such cases there appears to be scope for the provision of more central depots for processing and for the further extension of centralized selling, which would lead to the elimination of destructive competition. The question of indebtedness is also an extremely important factor, since the burden of debt weighs heavily on the smallholder and handicaps his efficiency. Interest rates are often exorbitant, and when the cultivator makes repayment to the trader in produce the price given may be substantially below the market price, and, moreover, the borrower is precluded from selling in the open market, and thus gaining the benefit from competitive demand. Co-operative marketing in conjunction with credit facilities is the obvious remedy, and some progress has been made in this direction, but much still remains to be done.

In the discussion which concludes the paper Dr. Tempany states that the comparative neglect of internal marketing is unfortunate for the well-being of colonial peoples, since the rise in their standard of living, whether they are regarded as buyers or sellers, is in many areas more dependent on a well-organized internal trade than on the export market. An essential condition for the diversification of agriculture in such areas is the creation of an adequate organization of internal markets for produce, without, however, relaxing efforts in regard to export commodities. Other points stressed by the author are the necessity for further study of the actual processes of marketing, the provision of greatly increased staffs of trained native supervisors of markets to ensure that existing or new markets are properly organized and run, and the fuller education of the people at large if the full benefits are to be derived from a wider exchange of goods of every kind.

27. AGRICULTURE IN THE BRITISH COLONIAL DEPENDENCIES. By H. A. Tempany. (*Crown Colonist*, March, 1942, p. 165.) A brief review of the situation

in regard to food production in the Dependencies in 1941, and of the condition of the major crops of sugar, bananas, cacao, oilseeds, rubber, cotton, tea, and vegetable drugs. The progress made in research and education is also discussed. The author writes in conclusion that "while war conditions have affected the position in an increasing degree, there is good reason to believe that in many respects the changes that have been brought about as a result will be in the end productive of benefit, and that the foundations are being laid for a more stable system of agriculture in the post-war period."

28. ASIA. BURMA: COTTON ACREAGE, 1941-42. (*Cotton*, M/c., 20/12/41, p. 6.) The area sown to cotton is estimated at 418,000 acres, as compared with 421,000 acres, the actual area under cotton in 1940-41. The condition of the crop is reported to be satisfactory except in certain areas, where more rain is needed.

29. CEYLON: COTTON INDUSTRY, 1939-40. (*Admin. Rpt. of Actg. Dir. Agr.*, 1940, recently received.) The year was a relatively favourable one for cotton cultivation, and a total of 2,315 cwt. was sold to the Spinning and Weaving Mills, Wellawatta, the amount paid to growers being Rs. 24,259.66. The figures for the previous season were 1,679 cwt. and Rs. 14,259.76 respectively. Unfortunately, unseasonal floods occurred at the time when much of the cotton purchased from the cultivators was awaiting transport to the mills, and some of it was damaged, with the result that the Cotton Purchase Scheme resulted this year in a loss to Government of nearly Rs. 2,000.

Experiments were carried out with the object of improving the quality and yield of local cotton. A demonstration of what can be produced in Ceylon was given at Embilipitiya Station, where 1 acre of cotton yielded 9 cwt. seed cotton. Of this, however, 3 cwt. were "second crop" cotton produced during the *yala* season. "Second crop" cotton is considered to be of inferior quality, and its collection is not recommended in Ceylon. The area in question was manured only with compost manure, and the soil is typical of the district where normal yields are 3-4 cwt per acre.

Thirteen more cotton varieties were imported for trial at Tissamaharama; they included five Egyptian or Sea Island strains, and the remainder American Uplands. A further field trial was made with the strains imported previously.

30. AFRICA. NIGERIA: COTTON INDUSTRY, 1939-41. (*Ann. Rpts. Dpt. Agr.*, 1939 and 1940, received 1942.) 1939-40 *Season*.—In the Northern Provinces the rise in cotton prices and the favourable weather conditions experienced resulted in a very satisfactory increase in the cotton purchased for export. The action of the Nigerian Railway in further reducing the cost of transport of cotton seed by their road transport services from 4d. to 3d. per ton mile was greatly appreciated as enabling more seed to be distributed than would otherwise have been possible. In the Southern Provinces the cotton crop suffered severe damage from *Helopeltis*, and on many farms the Ishan crop was completely destroyed.

1940-41 *Season*.—In the Northern Provinces the crop was the largest on record, being approximately 64,900 bales. There is now a group of strains in the Northern Provinces giving much higher yields than the ordinary Allen cultivated. They have slightly different characteristics from the ordinary commercial type when spun into yarn, and careful enquiries are being made concerning the extent and value of the market for such cottons. In the Southern Provinces production amounted to approximately 4,591 bales, compared with 1,300 bales in 1939-40. Annual single plant selection of Ishan A. remains the basis of the cotton breeding work in the South. On the advice of the Corporation's expert the intercrossing of Ishan × Sea Island has been discontinued and attention devoted to a really

EMPIRE COTTON GROWING CORPORATION

The regular quarterly publication of the "Empire Cotton Growing Review" has been suspended for the duration of the war It has been decided, however, to continue the publication of two numbers annually, in June and December, consisting entirely of abstracts from scientific, commercial, and technical literature. The price of each issue will be 1s. 3d. post free It is hoped that those who are already subscribers will bring these Abstract Numbers of the "Review" to the notice of others, and urge them to become subscribers also

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strong and rough-linted Ishan type of cotton. An Agricultural Technical Assistant visited the Ishan district during the season and made rough-linted selections from among plants on native farms; these will be grown and further examined at Ibadan during the 1941-42 season.

For many years the Empire Cotton Growing Corporation has maintained a cotton-seed multiplication farm at Daudawa in Southern Katsina. In order to ensure that the work done there fitted in as closely as possible with the work of the Agricultural Department the Corporation offered to transfer the control of the farm to the Department. The offer was gladly accepted and the farm was handed over on April 1, 1941. The Corporation is contributing £1,600 per annum towards the upkeep of the estate for a period of five years. The Dept. of Agriculture places on record its appreciation of this generous gesture and also of the help which it has received from the Corporation and its staff ever since Daudawa was established.

31. NYASALAND: COTTON INDUSTRY, 1939-40. (*Ann. Rpt. Dpt. Agr.*, 1940, received 1941.) The number of growers in the whole Protectorate showed an increase of 17 per cent. over the previous season, the increase occurring mainly in the Lower Shire and Central Shire areas, and being some 33·6 per cent. throughout the Southern Province. In the Northern Province, however, with the exception of the North Nyasa district, which showed an increase of nearly 66 per cent., there was a decrease in all districts, and for the whole Province there was an 11 per cent. decline in the number of growers, and production here was some 220 tons less than in 1939. Lack of attention to gardens in the Ncheu, Dedza, and Dowa districts was mainly responsible for this reduction, as yields at the Domira Bay Station of the Empire Cotton Growing Corporation were exceptionally good, the mean being 973 lb. seed cotton per acre. The total cotton crop for the Protectorate of 3,520 tons, of which private estates produced 506 tons, showed an increase of approximately 23 per cent. on the previous season's figure. Prices averaged 1·131d. for No. 1; 0·563d. for No. 2; and 0·272d. for No. 3 grade.

The season was very favourable at the Domira Bay Station, the cotton crop reaching a new high record. Experimental work with various strains confirmed that the U.4 × Cambodia × U.4 cross gave the best yield. Investigations in connection with cotton pests were continued by the Insect Pest Control Staff of the Corporation, and progress was made in the accumulation of information regarding the two major pests, red bollworm and stainers.

32. COTTON INDUSTRY, 1940-41. (*Nyasaland Agr. Qrtrly. J.*, July, 1941, p. 4.) Cotton markets opened during July and estimates given in June of 840 tons of seed cotton in the Southern Province and 355 tons in the Northern Province (excluding Northern Nyasa) are expected to be realized. The Cotton Auction held in June represented a return to growers on or near the railway line of over one penny per pound for Grade 1 seed cotton, which is considered to be satisfactory. Quality of the cotton is exceptionally good.

33. A TALK ON COTTON GROWING IN NORTH NYASA DISTRICT. (*Nyasaland Agr. Qrtrly. J.*, July, 1941, p. 12.) An instructional paper on cotton cultivation specially written for the people of the North Nyasa District by the Agricultural Supervisor, Karonga, in co-operation with the Protectorate Cotton Officer.

34. STUDIES ON THE PHYSICO-CHEMICAL PROPERTIES OF ASSOCIATED BLACK AND RED SOILS OF NYASALAND PROTECTORATE, BRITISH CENTRAL AFRICA. By S. P. Raychaudhuri. (*Ind. J. Agr. Sci.*, xi., **1**, 1941, p. 100.) A review of the existing literature dealing with the contrasted nature of tropical black and red soils has been made. Physico-chemical properties of two contrasted soil profiles, red and black, occurring in close proximity at Domira Bay in the Nyasaland

Protectorate, have been compared. Clay fractions from the red and black soils have approximately the same SiO_2/Al_2O_3 and $SiO_2/(Al_2O_3+Fe_2O_3)$ ratios. If, however, soil samples are considered from equivalent layers of the profile the red clay seems to possess a somewhat lower ratio than the black. Red clay fractions contain more free iron oxide and free alumina than the black, as given by Turog's treatment. Also the black clay fraction contains more free silica than the red. The percentage of organic carbon of the black soil of Domira Bay was somewhat higher than that of the equivalent layer of red, but not enough to cause the enormous difference in colour of the two soil types. The C/N ratios of the black soils were uniformly higher than those for the red, suggesting that the proportion of protein matter was higher in the red soil than in the black. The organic matter of the black soil appeared to be more readily oxidizable than that of the red. The buffer curves of black soils are more flattened than those of the red, indicating that the former are more active. The black soils have higher moisture equivalents and higher imbibitional moisture capacities than the red soils, although the two soil types have nearly the same clay contents. The black soils are base-saturated to a greater extent than the red ones. The data also show that the black soil contains nearly twice the quantity of exchangeable bases as the red soils.

35. SOUTHERN RHODESIA: COTTON INDUSTRY, 1940-41. From the report of the Cotton Specialist, Major G. S. Cameron, we learn that weather conditions during the season were unfavourable for cotton, the average yield per acre being 328 lb. compared with 416 lb. in the previous year. Cotton production by natives also declined, since no propaganda drive was undertaken similar to that made in 1939. Against this, however, the demand by natives for seed for planting in 1941 almost trebled that made in 1940.

At the Cotton Breeding Station, Gatooma, the season was not a good one, maize and cotton yields being about 50 per cent. and 66 per cent. respectively of what they were in the previous year. Compost trials again showed significant results when applied to cotton, yielding nearly twice as much when ploughed in as when harrowed in. The new strain 7.L.1 was not available in sufficient quantity to meet the full demand for planting seed, and the strain G.5.123 had to be drawn upon. Four new strains were bulked up to give sufficient seed for variety trials plus a seed reserve of each in case one strain proved outstandingly better than the others. Over 400 single plant selections were made in the field, and 165 were retained after laboratory examination, and are being carried forward into 1942 together with replantings of the 1939 selections. In connection with colchicine treatment of cotton seedlings, progenies of certain strains treated the previous year behaved in an irregular fashion, the reason for which is as yet not understood. A number of these progenies appeared to show improved lint qualities over the parent plants. Plants from thick-leaved parents reverted to normal, while a thickening of the leaves appeared in plants whose parents were normal in this respect. Seedlings from native cottons, which failed to respond to colchicine treatment, were subjected to radiation through acenaphthene crystals, the technique employed being based on that of Kostov (*cf.* Abstr. **534**, Vol. XVI. of this REVIEW). The results obtained were rather striking: bolls became elongated and there seemed a definite lengthening of lint hairs. If these results are carried forward in succeeding progenies, the technique should prove useful to plant breeders.

Comparatively slight injury to cotton was caused by pests and diseases during the season. Sudan and Spiny bollworm were fairly plentiful, and termites did sufficient damage to warrant their inclusion among the major pests of cotton. There was very little angular leafspot and no evidence of blackarm.

Ginning operations were transferred from Bindura to Gatooma. This caused some delay, and ginning commenced on September 23 and was completed by November 17.

Prospects for the 1941-42 *Season.*—The Government's decision to guarantee prices for locally grown cotton over a period of five years has had an immediate response from growers, and the demand for planting seed indicates a three- to four-fold increase in acreage. The establishment of an Absorbent Cotton Factory and Spinning Mills at Gatooma will enable a large proportion of the local cotton crop to be processed in the country, but additional machinery will be required to cope with any further extension of production.

36. SOUTH AFRICA: COTTON INDUSTRY, 1940-41. (*Farmg. in S. Afr.*, December, 1941, p. 412.) The cotton crop is expected to be about the same as in the previous season—namely, 1,650 bales of 500 lb. Although this figure is much better than those of the past few seasons, it does not testify to any important development in the cotton industry. What is of particular importance to cotton producers, however, is the fact that the war has not only brought about an improvement in cotton prices, but it has also made them less dependent upon the oversea market. This is clearly evidenced by the fact that up to the present about half of the crop has been disposed of for processing in the Union itself. To what extent this is merely a temporary development due to the war is difficult to say at this stage, but strong attempts are being made to erect a cotton-spinning factory in the Union, and if this scheme materializes it may serve as a fresh incentive to cotton production in South Africa.

37. COTTON PLANT: DEVELOPMENT AND YIELDS UNDER IRRIGATION IN THE SUDAN. By F. Crowther (*Ann. Bot.*, **5**, 1941, p. 509. From *Summ. Curr. Lit.*, **21**, 1941, p. **514.** Observations on the development and yields of cotton plants carried out over a period of thirteen years in an observation plot at the Gezira Research Farm are discussed. Significant correlation was found between the leaf nitrogen (as percentage of dry weight) within two weeks of sowing and the final yield four to seven months later. In years in which leaf nitrogen was high shortly after germination the crop grew vigorously and was both taller and produced a total dry weight greater than normal. Flower numbers were also high in these years of vigorous growth. Defoliation, measured by the number of leaves shed from the main stem, proved to be more highly correlated with yield than all the other growth characteristics observed. Heavy leaf shedding three to four months after sowing was regularly followed by low yields; where the lower leaves persisted longer than usual yields were correspondingly higher. Apparently defoliation is an index not only of crop size, a vigorous crop maturing later than one of stunted growth, but also of any subsequent damage to leaves. In the experiment blackarm disease was frequently severe and was responsible for part of the defoliation. The experiment provides critical information on the causes of seasonal yield fluctuation. Although both blackarm and leaf curl were severe in years of low yield, the data collected early in the season proved growth to be inferior before the disease had become widespread. It is concluded that a "soil factor," with which the amount of nitrogen available for the crop is closely associated, is primarily responsible for the major yield fluctuations and that the rôle of both blackarm and leaf curl is secondary. The yields of the experiment from season to season correspond fairly closely to those of the surrounding commercial area, if allowance is made for a progressive improvement in the soil fertility of the experimental area resulting from crop and fertilizer residues. Equations are given for forecasting the yield of the experiment at monthly intervals from shortly after sowing onwards.

38. PRODUCTION IN THE UGANDA PROTECTORATE. (*Crown Colonist*, February, 1942, p. 76.) The main industry of the country has for years been the production of cotton. This is grown entirely by native cultivators, and marketed under Government supervision to buyers who gin and export it. The quality of the crop is good, and it commands a substantial premium over American Middling. Very little of the cotton has been shipped to England since 1939, and India, which requires this particular type, has taken the bulk of the cotton. The acreage under cultivation has steadily increased during recent years, and some 368,000 bales were produced in the 1940-41 season. The present policy is to increase production by better cultivation rather than by increased acreage. Of recent years there has been a considerable demand from overseas for cotton seed for crushing purposes, but shipping difficulties since the outbreak of war have put a stop to overseas export.

39. UGANDA: COTTON PROSPECTS, 1941-42. The report from the Dept. of Agriculture dated December last states that " continued heavy rains well above normal have seriously damaged early planted cotton, but later sowings have benefited and will give good yields provided the weather follows its normal course and drier conditions prevail from now on. Blackarm disease is more prevalent than last season, and is causing damage in several districts. The condition of the crop at the time of writing would appear to warrant an estimate of approximately 365,000 bales."

40. COTTON INDUSTRY, 1941-42. (*Crown Col.*, March, 1942, p. 172.) The cotton season opened in the Eastern and Northern provinces on January 19. Prices at the beginning ranged from Sh. 9.50 per 100 lb. seed cotton to the native grower in Busoga district to Sh. 7 in Lango district, but on the second day dropped 50 cents all round owing to weakness in the l nt market. Lint was quoted at 44 cents. per lb. best quality, Kampala, but improved later to 46 cents. Buying was slower than usual owing to damage to cotton by unseasonal rains late last year, and to Government and ginners insisting on picking over, which resulted in the grade being up to standard.

41. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1939-41. (*Ann. Rpts. Dpt. Agr. and Stock.*, 1939-40 and 1940-41, recently received.) *Cotton* 1939-40.—Seasonal conditions generally were unsatisfactory for cotton, and a combination of fiscal uncertainty and the lateness of planting rains caused a steep decline in production. With the renewal of the bounty on raw cotton and the rapid expansion of the home market an intensive campaign to stimulate production was made, and a greatly increased acreage was expected for 1940-41. Growing cotton under supplementary irrigation was investigated during the year, the results being in favour of irrigation where it can be practised economically. Further progress was made in the development of superior strains of cotton suited to the requirements of Australian spinners, the outstanding varietal performance being that of Oklahoma Triumph. In breeding experiments in the South Burnett district successful progress was made with New Mexico Acala, which may eventually become the leading staple cotton. Satisfactory progress was also made with the hybridization project between the jassid resistant U.4 variety and Miller, the cotton most extensively grown in Queensland. Damage by insect pests was not so severe as in some years, the chief pests being locusts, rough bollworm, corn earworm, cotton loopers, and jassid.

Cotton, 1940-41.—Weather conditions were generally unfavourable for cotton, but in spite of this yields showed a substantial increase. In view of the wartime importance of the crop much attention was devoted to problems in plant breeding, entomology, soils, irrigation, and plant physiology connected with cotton. The quick-maturing Oklahoma Triumph variety was again outstanding, and other

promising strains were New Boykin and Lone Star. Work was continued with some measure of success in the breeding blocks of Farm Relief, New Mexico, Acala, Stoneville, Qualla, and Half-and-Half, but as yet no strains of outstanding merit have been evolved. Several thousand acres of an improved strain of Miller are expected to be planted next cotton season. Cotton pests were fairly active during the season, the most important being corn earworm, cotton looper, pink bollworm, and jassid.

42. FIJI: COTTON EXPERIMENTS, 1940-41. (*Agr. Jour. Fiji*, **12**, 4, 1941, p. 115.) Upland (short staple) varieties of cotton from Queensland have been under trial to compare returns with those from Sea Island (long staple) cotton as hitherto grown in Fiji. Yields of over 1,000 lb. per acre were obtained on trial plots. Investigations are not yet completed.

43. WEST INDIES: SEA ISLAND COTTON CROP, 1941. (*W. Ind. Comm. Circ.*, 30/10/41, p. 264.) The total acreage planted was 19,030 acres, and the yield amounted to 3,083,500 lb. of clean lint. "Superfine" strains are grown in St. Vincent (V. 135), Barbados (S. 27 [6]) and St. Lucia (V. 135). An "ordinary" strain (M.S.I.) is grown in all the other islands.

44. BARBADOS: COTTON INDUSTRY, 1939-40. (*Ann. Rpt. Dpt. Sci. and Agr.*, 1939-40.) 120 acres were planted to cotton; growth on the whole was good and yields of seed cotton better than for some years past. Progeny row and bulking plots were grown during the season and the seed from these will provide commercial planting material for the 1941-42 crop. During the period under review no pink bollworm was found in the field or at the ginnery. The cotton leafworm (*Alabama argillacea*) appeared at the usual time, but was kept in check by dusting and spraying. To secure the introduction of only healthy material into the island the holds of fifteen ships were fumigated with "Zyklon B" and 9,613 bags of imported cotton seed were disinfected by means of the Simon's Heater.

45. INCREASED COTTON PLANTING, 1940-41. (*W. Ind. Comm. Circ.*, 25/12/41, p. 314.) The close season in Barbados ended on August 31. Seed distribution started on August 27, and, partly on account of favourable rains on that night, requests for seed were larger than had been expected. By the end of the month seed had been issued for approximately 1,200 acres, divided between plantations and peasants in the ratio of approximately one to three respectively. This acreage was already largely in excess of that for many years past.

46. GRENADA: COTTON EXPORT REGULATION. (*W. Ind. Comm. Circ.*, 13/11/41, p. 279.) Official notice has been given that, as from January 1, 1942, and until further notice, exports of Marie Galante cotton will not be permitted to exceed 2,100 cwt. annually. No shipper will be granted licence to ship more than the quantity exported by him in 1940.

COTTON IN THE UNITED STATES.

47. COTTON QUALITY STATISTICS, UNITED STATES, 1939-40. (*U.S. Dpt. Agr., Agr. Market. Serv.*, 1940. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 684.) Continues the series on grade, staple length, and tenderability of cotton. Figures are included for the first time on the grade and staple length of the supply (carry-over plus crop) and the disappearance of Upland cotton.

[*Cf.* Abstr. **219**, Vol. XVI. of this Review.]

48. AMERICAN COTTON HANDBOOK. By G. R. Merrill *et al.* (Amer. Cott. Handbook Co., New York. Price: U.S. and Canada, $4.80; other countries,

$6.00. From *Text. Manufr.*, January, 1942, p. 25.) The book covers information on the historic, economic, social, technical, and chemical phases of cotton growing and manufacturing in the United States.

49. COTTON PRICE RELATIONSHIPS AND OUTLETS FOR AMERICAN COTTON. By L. D. Howell. (*U.S. Dpt. Agr., Tech. Bull.* 755, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 834). The relation of cotton prices to the supply and demand, price differences for quality and location, the relations of changes in prices of American cotton to other growths, and of price ratios to supply ratios and consumption ratios are analyzed and discussed.

50. SEA ISLAND COTTON RESEARCH EFFORTS. (*Cotton*, M/c., 7/3/42.) An instance of peace-time research given in a recent report of the U.S. Bureau of Plant Industry is the work of the Bureau in developing extra long staple cottons. Sea Island cotton has the longest and strongest fibres of any type, and has been used in the manufacture of balloons and parachute cloths, gas cells for dirigibles, and airplane wing coverings. New strains of Sea Island coming into production in 1942 have even longer and finer fibre, which makes them more useful in meeting war needs. The S×P variety of American-Egyptian cotton developed by the Bureau, and now in large-scale production in the south-west, is being used for making balloon cloth and inflatable pontoons for seaplanes.

51. AMERICAN-EGYPTIAN COTTON IN THE U.S.A. (*Cotton*, M/c, 17/1/42, p. 6, and 7/2/42, p. 5.) The recent sharp increase in the acreage and production of American-Egyptian cotton has been mainly due to (1) the reduced production of Sea Island—the only other extra-long staple cotton grown in America—from 118,000 running bales in 1916 to 7,000 bales in 1919, largely because of boll-weevil damage; (2) increased difficulties in obtaining suitable supplies of Egyptian cotton; and (3) heavy demand for extra-long staple cotton for making strong and durable fabrics for airplane wings, balloons, automobile tyres, and for many other military and civilian uses. Prices advanced sharply, and the acreage of American-Egyptian cotton was greatly increased.

Consumption in the 1940-41 season totalled nearly 27,000 running bales, the highest since 1923-24. The indicated production for the 1941-42 season is estimated at 72,000 bales of 500 lb. each (equivalent to about 70,000 running bales), and the carry-over on August 1 last at nearly 16,000 bales, giving a total supply of about 86,000 bales for the season.

52. SUN SPOTS AND MAGNETIC STORMS: EFFECTS ON AMERICAN TEXTILE INDUSTRY. By P. M. Strang. (*Text. Res.*, **11**, 1941, p. 447. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 559.) During the spring months of 1938 and 1940 New England cotton mills had trouble in maintaining both the quality and production of their goods. Declines in yarn quality were observed even in cases where the same mixing of cotton had been spinning satisfactorily and the same equipment producing satisfactory results for a considerable time. Manufacturers in the south also commented on a falling off in yarn strength and the fuzzy appearance of the yarns, but in general their difficulties were not as great as those in the Northern States. Rayon and wool manufacturers were also having trouble. At the same time the telephone, telegraph, and power companies were experiencing unusual difficulties in the operation of their systems as a result of magnetic storms caused by sun spots. A study of the distribution of these disturbances and of the textile industry shows that the industry is located in sections where the atmosphere is susceptible to electrical disturbances which vary in intensity from a minimum at the equator to a maximum near the Canadian border, and largely in sections of high earth resistivity. The experience of manufacturers during the magnetic storm of 1940 is discussed, and mention is made of one mill which had to shut down some of its processes one morning

because of static electrification. It is pointed out that the entire European textile industry, including that of Great Britain, is outside the field of maximum intensity of the magnetic storms, and it is suggested that this may account in some measure for differences between results obtained there and in America. There are indications that sun spots merely accentuate an atmospheric condition which normally affects textile manufacturing to a much smaller degree. Seasonal variations in static electricity have been observed by manufacturers. Daily and annual cycles in the amount of ionization of the air have been recorded, and it is suggested that these are related to cycles in manufacturing processes. A similarity is observed between curves showing the daily ionization cycle and the daily change in end breakage in spinning. A curve showing daily variation in loom stops also has a similar form. The amounts of ionization vary with latitude, altitude, and other conditions. The need for further research on the effects of ionization and sun spots is pointed out, and it is suggested that they may affect cotton fibres during their growth. It is also pointed out that results of textile research obtained in one region may not at once be applicable in other regions.

53. ALABAMA: AGRONOMIC RESEARCH IN 1939. (*Alabama Sta. Rpt.*, 1939. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 470.) The work on cotton included breeding experiments; variety tests; the response of cotton to Mg and rare elements in South Alabama; top dressing cotton with potash; influence of soil moisture and fertilizer applications on the oil and protein content of cotton seed.

54. FIELD CROPS RESEARCH IN ARIZONA. (*Ariz. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 608.) The work with cotton included varietal and breeding tests, and experiments concerned with irrigation needs, heat resistance, and lint strength of cotton.

55. LOUISIANA: COTTON PLANTATION LABOURERS: A SOCIO-ECONOMIC STUDY OF LABOURERS ON COTTON PLANTATIONS IN CONCORDIA PARISH. By S. E. Grigsby and H. Hoffsommer. (*La. Sta. Bull.* 328, 1941. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 266.) A study of the social and economic conditions of negro farm labourers in a typical cotton-growing parish. The total average annual cash income for negro males from all sources, including the earnings of dependents, was $175. One-half earned $150 or less, a third from $150 to $200, and the remainder (15 per cent.) upwards of $250. The greater proportion of the labourers had an income of less then $150 from agriculture. The median income from this source was $81. No relationship appears to exist between the size of income and education.

56. LOUISIANA: U.S. SOUTHERN REGIONAL RESEARCH LABORATORY: ACTIVITIES. By W. M. Scott. (*Amer. Dyes. Rpt.*, **30**, 1941, pp. 604, 619. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 55.) An account is given of the proposed organization of research in the Cotton Chemical Finishing Division of the Southern Regional Research Laboratory established at New Orleans by the U.S. Dept. of Agriculture. Some of the properties of cotton that will receive attention are listed, and mention is made of the fields in which each property is particularly important. The chemical finishing research is being organized in two sections: (1) an additive finishing section for the study of treatments depending on the addition of chemical compounds to the cotton, and (2) a modified finishing section for the study of treatments in which the surface characteristics of the cotton are altered by the action of chemical agents. Consideration will be given to the effects of the various compounds and agents on cotton properties, and to the development of new compounds and agents and new methods of application. A list is given of some of the items of textile testing equipment which will be used for the evaluation of finishing treatments. The Laboratory is being equipped to demonstrate

on a pilot-plant scale the commercial practicability of each successful laboratory development. Practical trials on a full commercial scale will be carried out by manufacturers and finishers who have indicated their willingness to co-operate. It is planned to use every suitable means to acquaint consumers with the merits of new developments in cotton textiles, and to this end a co-operative agreement has been effected with the U.S. Bureau of Home Economics.

57. MISSISSIPPI: CHEMICAL DUST DISINFECTANTS INCREASE STANDS, YIELDS, AND MONEY RETURNS FROM COTTON, IN TESTS CONDUCTED FOR TWELVE YEARS. By L. E. Miles. (*Miss. Farm. Res.*, **4**, 5, 1941, p. 2. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 493.) Tests in Mississippi over a twelve-year period are reported to have shown that cottonseed treatment with certain disinfectants prior to planting will prevent losses due to poor stands and will yield high returns in profit for the small amount invested. Ethyl mercury chloride and ethyl mercury phosphate (Ceresan and New Improved Ceresan respectively) gave best results among the dusts tested.

58. NEW MEXICO: NATIVE COTTON CULTIVATION. By L. A. White. (*Sci.*, **94**, 1941, p. 162. From *J. Text. Inst.*, xxxii., **11**, 1941, A497.) The cultivation of cotton by Indian pueblos in the Rio Grande Valley has been traced back beyond 1540, but has long since been discontinued except for ritual purposes. A specimen collected in 1936 is identified as closely related to *Gossypium hopi*, though it bears some resemblance to *G. hirsutum*. The strain appears to be a relic of aboriginal agriculture.

59. NORTH CAROLINA: FIELD CROPS RESEARCH, 1939-40. (*N. Car. Sta. Bien. Rpt.*, 1939-40. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 33.) Work on cotton included varietal trials; breeding better cotton by changing the number of chromosomes; fertilizer experiments; cotton fibre research dealing with relation of arrangement of cellulose within the fibre to strength of fibre and its modification by environment, growing conditions, and relation of variety and season to fibre and yarn properties; effect on stands of treating cotton seed with organic mercury dusts.

60. OKLAHOMA: COTTON VARIETY TESTS CONDUCTED AT LAWTON IN 1940. By H. E. Dunlavy *et al.* (*Oklahoma Sta. Circ.* 93, 1941. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 474.) The 14 high-yielding cottons among the 55 varieties and strains tested at the U.S. Dry Land Field Station in 1940 represented the Acala 5, Deltapine, Stoneville, Lone Star, Triumph, Rowden, and Hi-Bred families or lines. These 14 varieties averaged 160 and 106 lb. more seed cotton and of seed per acre respectively, and returned $4.68 more per acre for lint than did the other 41 varieties. The 55 varieties produced an average of 516 lb. of seed per acre, estimated to contain about the same amount of protein as 22 bu. of corn or 14 bu. of wheat. The 14 varieties averaged slightly over 15/16 inch, ranging from 13/16 to 1 inch in staple length, while the other 41 varieties averaged slightly over 31/32 inch and 15 of the 41 stapled longer than 1 inch. The average cost of picking and ginning a bale for the 55 varieties was $13.55, and for pulling and ginning $14.14. Data on these and other agronomic characters and factors are tabulated and discussed.

61. COTTON BURS AS FERTILIZER. By H. Freudenberger. (*Acco Press*, **19**, 10, 1941, p. 20. From *Cott. Lit.*, December, 1941, p. 491.) Yield increases averaging 189 lb. seed cotton per acre were obtained at the Oklahoma Agricultural Experiment Station by fertilizing Upland cotton with 3 tons of cotton burs to the acre.

62. SOUTH CAROLINA: LESPEDEZA INCREASES COTTON YIELDS. By A. B. Bryan. (*Prog. Farmer*, **56**, 3, 1941, p. 33. From *Cott. Lit.*, June, 1941, p. 219.) Results

of tests at the Experiment Station indicate that cotton following lespedeza yielded 939 lb. per acre as compared with 538 lb. where cotton followed cotton.

63. TENNESSEE: COTTON STORAGE. By G. E. Allred and B. D. Raskopf. (*Tenn. Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 127, 1941.) From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 684.) Discusses the location, capacity, functions of warehouses; storage and compression charges; distribution, trend, and length of storage; reasons why farmers store or do not store cotton, etc.

64. COTTONSEED TREATMENTS IN TENNESSEE. By N. I. Hancock and D. M. Simpson. (*Tennessee Sta. Bull.* 175, 1941. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 210.) Seedling diseases are said to be specially troublesome in Tennessee, where adverse growing conditions are common at planting time. Organic mercury dusts have proved to be inexpensive insurance against such troubles, New Improved Ceresan (1½ oz. per bushel of seed) being recommended, but with care in handling and in keeping away from livestock. Seeds delinted either mechanically or by acid are planted more evenly and germinate more quickly under low temperature and soil moisture. Dry seeds untreated or treated with Ceresan can be stored profitably for future use.

65. TEXAS: WINTER LEGUMES AS SOIL IMPROVING CROPS FOR COTTON. By E. B. Reynolds *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 62.) Successful results were obtained with the ploughing in of hairy vetch as a soil-improving crop preceding cotton. Some of the vetch plats were fertilized with 400-500 lb. of 0-8-4 per acre, and others received nothing. Results obtained on the sandy soils at College Station, Nacogdoches, and Tyler showed definitely that the ploughing under of vetch furnishes an abundance of nitrogen for cotton following, that the application of 100-200 lb. superphosphate per acre is necessary to secure the full benefit of the vetch, and that these treatments have increased the average yields of cotton 40-65 per cent.

66. PUERTO RICO: A NEW COTTON STRAIN. (*W. Ind. Comm. Circ.*, 13/11/41, p. 271.) A new strain of Sea Island cotton was further tested in the 1939-40 season. The year's crop showed a lint length of 2 in., 29 per cent. lint, and a lint-index of 3 82. On 23 acres planted at Lafayette the yield was nearly 1,300 lb. seed cotton per acre.

67. EL CULTIVO DEL ALGODÓN EN LA COSTA NOROESTE EN 1939 FUÉ LUCRATIVO. By L. M. Géigel. (*Rpt. No.* 16 *of P.R. Agr. Exp. Sta.*, mimeographed. From *Cott. Lit.*, June, 1941, p. 226.) Gives the costs and returns in producing Sea Island cotton on the north-east coast of Puerto Rico in 1939.

COTTON IN EGYPT.

68. EGYPT: COTTON ACREAGE RESTRICTED. (*Cotton*, M/c., 31/1/42, p. 1.) Both Chambers of the legislature have finally approved a Bill restricting cotton acreage to 22 per cent. of the cultivated area in the Northern Delta and 15 per cent. in the remainder of the country, instead of 27 per cent. and 23 per cent. respectively as provided in earlier legislation. Cotton-growing is also prohibited in all basin land, while no land is to remain fallow this year. These measures are expected to make good the deficiency of cereals.

69. COTTON IN EGYPT. By J. A. Todd. (*Text. Mnfr.*, lxviii., **806**, 1942, p. 68.) "The Egyptian Government's decree, prohibiting the planting of cotton in 1942 in all basin lands of Upper Egypt and in two provinces and part of another in Lower Egypt, and restricting cotton plantings elsewhere to 23 per cent. of the total land under cultivation, is expected to result in a reduction in the total

planted acreage this year to 1,110,000 feddans. This compares with an average in pre-war years of 1,700,000 feddans. Production in 1942 may therefore be curtailed to between 5,500,000 and 6,000,000 kantars, as against a pre-war normal of around 9,000,000 kantars. It is probable that growers, in view of the large accumulated stock of short staples from the 1940 and 1941 crops, will plant Giza 7 and other long-stapled cottons more freely this year. The Egyptian Government has been influenced to take this drastic action in reducing cotton production by the serious congestion of unsold surpluses from previous crops and by the imperative need for Egypt to grow more foodstuffs to make good the deficiency of imports and provide for steadily increasing military requirements."

70. EGYPTIAN COTTON: NEW VARIETIES. (*Cotton*, M/c., 14/3/42.) Growers of the new Egyptian cotton Karnak—formerly known as Giza 29—have again reported a successful year, and a further marked expansion of acreage under this variety is expected this season. Present indications are for still further expansion to a dominating position in the Delta in 1943. Karnak is reported to have an appreciably better spinning value than Giza 7. The present longest-staple Egyptian variety, Malaki—formerly known as Giza 26—which is also slowly increasing in acreage, has not yet become freely available for ordinary commercial purposes.

COTTON IN OTHER FOREIGN COUNTRIES.

71. ARGENTINA: MANUFACTURE OF COTTON BAGS FROM SURPLUS COTTON. (*Cotton*, M/c., 7/3/42.) A United States Dept. of Agriculture report states that owing to growing difficulties in finding export markets for surplus cotton, the existing shortage of jute bags, and the needs of industries requiring bags in their operations, the Government of Argentina has authorized the allocation of 10,000,000 pesos ($3,000,000) for the construction of a National Cotton Sack Factory to make bags from surplus cotton. The factory will have an estimated production capacity of 30,000,000 sacks a year, or sufficient to supply the 20,000,000 to 23,000,000 bags used annually by the flour and meal industries, leaving some 7,000,000 to 8,000,000 bags for other uses. It will be difficult to have the plant in operation before 1943 because of delays in securing machinery from America. The construction and initial management of the factory will be under the supervision of the Argentine Cotton Board, who have for several years advocated the use of low-grade cotton from the Chaco for making cotton bags. It is expected that the factory will aid colonization in the Chaco and Formosa territories in northern Argentina.

72. BRAZIL: COTTON LINTERS. (*Cotton*, M/c., 1/11/41, p. 6.) The production of cotton linters in the State of São Paulo during 1941 is estimated at 68,000 metric tons, compared with only 16,000 tons in 1936, and it is expected that exports will reach 60,000 tons valued at 70,000 contos. Brazil may thus supersede India as the largest world-exporting country for this product. There is at present a large demand from America for first-cut linters which are used in the manufacture of explosives and artificial silk. The local price of linters is now only slightly below that of type 7 cotton, the reason being that first-cut linters may be imported into the U.S.A., whereas ginned cotton is excluded by quota.

73. COTTON PRODUCTIVITY IN THE STATE OF SÃO PAULO. (*Bull. Chamb. Comm., S. Paulo*, No. 24, 1939. From *Pl. Bre. Abs.*, xii., **1**, 1942, p. 58.) The paper refers to experiments with selected U.4 cottons from South Africa which gave greatly increased yields in comparison with the types of Upland generally grown in the State of São Paulo. The opinion is given that these types of U.4 are

likely to solve the problem of poor productivity in certain districts where the Express-Texas varieties have been previously grown.

74. China: The National Agricultural Research Bureau, Chungking. Rpt. for the Year 1938. (*Misc. Pubn.*, No. 8, Chungking, December, 1939, received 1942.) Gives the history of the National Agricultural Research Bureau and its journey to West China. Since the war, China's cotton belt has gradually fallen into the hands of the Japanese, and shortage of raw cotton is a growing threat. To meet the situation new fields of cultivation are being explored, of which Szechwan shows the greatest promise, with Yunnan ranking second. Experiments with new varieties and better cultural methods are being carried out: the best results were obtained with the American Delfos cotton. The tree cotton of Yunnan has a lint length of 1¼ to 1½ in.; it is strong in tensile strength, and yields more than 42 skeins of yarn per pound of cotton. These tree cottons are of high quality, high yield, resistant to insect pests and diseases, and easy of cultivation.

75. Ecuador: Cotton Crop, 1941. (*Cotton*, M/c., 22/11/41, p. 6.) The crop is now expected to reach 11,700 bales, despite adverse weather conditions in the early part of the current season. According to advices to the U.S. Office of Foreign Agricultural Relations, last year's production of some 9,200 bales was not quite sufficient for domestic mill requirements and small quantities were imported from Peru. Ecuador's soil and climatic conditions are said to be generally suitable for cotton growing, and a considerable expansion of acreage may be possible. The chief detriment to the industry in the past has been the inability of farmers to obtain sufficient credit to expand, and a recent campaign, by the press and cotton planters, to remedy this situation is expected to bring results when planting begins in 1942.

76. El Algodon Mexicano: Sus Necesidades de Exportacion. (*Rev. de Econ.*, **4**, 9, Mexico, 1941, p. 29. From *Cott. Lit.*, January, 1942, p. 12.) A discussion of Mexico's position as an exporter of cotton, setting forth the acreage cultivated, population engaged in the industry, production, domestic consumption, exports, the quota assigned by the U.S. to Mexico, the place of cotton among the country's agricultural exports, and the balance of trade between Mexico and the United States. Reasons are given why Mexico should not reduce her cotton areas, and why the United States' quota for Mexican cotton is too small.

77. Peru: Régimen de Explotación de los Fundos Algodoneros. By B. V. Nanez. (*Com. Admin. del Guano. Boletin*, 17, **6**, 1941, p. 243. From *Cott. Lit.*, October, 1941, p. 400.) Describes the cultivation of cotton in the eighteen cotton valleys of the coastal region of Peru by the owners, by tenants, or by the "yanaconas" or Indians to whom the land is turned over in small plots, and who are responsible to the owner or his representative. The reasons for the prevalence of one or the other systems in the different districts are given, and their advantages and disadvantages discussed.

78. Russia: The Cotton Research Institutes in the Third Five-Year Plan. By A. Gorcakov. (*Sovetskii Khlopok*, **11/12**, 1939, p. 17. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 308.) Certain criticisms of the work of the experiment stations in the past are offered, with indications of many possible lines of improvement.

79. The Egyptian Cotton Variety 213 (in U.S.S.R.). By K. Tsinda. (*Sovetskii Khlopok*, **8**, 1940, p. 35. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 304.) The variety was produced in 1931 by individual plant selection from the variety Janovic. It is 7-8 days earlier than Maarad and yields 44 per cent. more cotton before the onset of the frosts than Pima and Maarad; this is a great

advantage, since such cotton is of a higher quality than that produced later. Its average yield of seed cotton in the six years 1934-39 was 16·4 per cent. higher than that of Maarad. Its yields have been much higher than Maarad in tests on collective farms, the difference in seed cotton varying from 0·5 to 14 c. per ha. and in lint from 0·3 to 5·6 c. per ha. In two cases its yields have been the same as Maarad, but it was never inferior. The variety is distinguished by bolls above the average in size, equal to or somewhat larger than Maarad, many having four locks and occasionally five. The ginning percentage was 29-31 as against 29-30 per cent. in Maarad. The 1,000 seed weight was 130-140 grm., the seeds being almost naked. The plant is some 10-30 cm. less than Maarad in height and is less spreading in habit. The stems are strong and pigmented. Monopodial branches are few or absent; there are many subsidiary sympodia and two bolls are frequently borne in one axil and the yield is therefore reliable. The lint length varies from 37 to 40 mm., with an average of 37-39; the lint is thin (metric number 7200-7900) and strong. In quality of both lint and fabric the new variety is regarded as superior to Maarad.

80. Long-Stapled Varieties of Egyptian Cotton in the Azerbaijan S.S.R. By A. Inozemtsev. (*Sovetskii Khlopok*, **9**, 1939, p. 28. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) New varieties of Egyptian cotton distinguished by greater earliness, productivity, and length of lint have been produced. The best are D-96 and 3408-I, which are 22-23 days earlier than the variety hitherto grown and have a lint length of 46-48 mm. They exceed the previous variety by 45-52 per cent. in yield of seed cotton and by 18-27 per cent. in lint yield; 89-91 per cent. of their yield is collected before the frosts.

81. New Varieties of Soviet Long-Linted Cotton in Turkmenistan. By V. Kulebjaev. (*Sovetskii Khlopok*, **11-12**, 1940, p. 34. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 304.) From 1931-39 the Turkmenistan Cotton and Lucerne Experiment Station has produced the following promising, relatively high-yielding and high-quality varieties of cotton of the Egyptian type with long lint: Nos. 2963 I, 348 II, 3169 I, 283 I 2, 1076 I, 151-2 I, and 910 I. Particulars are given of their origin and their characteristics and performance in various trials and in spinning tests. In 1933, in order to obtain a cotton plant of compact habit for mechanized harvesting, some hybridization experiments were begun by the author with two selections from Ashmouni-0670—namely, 283 I2 (used as the female parent) and 1076 I (as the pollinator)—and these selections were characterized by earliness and short sympodia and internodes. Nine combinations were made. In the third generation family No. 101 from one combination segregated for four types of branching; and strain No. 3169 I was selected for multiplication as a line with the determinate branching habit, though some segregation was found to be still occurring in the F_4. Strain 151-2 I is another early variety in which plants without monopodia frequently occur. Economic conditions in the U.S.S.R. have created a demand for cottons with coarser lints, but of good quality, for admixture with wool in manufacture or for use as a substitute. In these types high yield, large bolls, and disease resistance must also be combined. Some large-bolled types with coarse lint have been bred from lines of *Gossypium barbadense* crossed by *G. peruvianum*, the final selections of this cross being lines Nos. 4844 I and 4848 I. Another line, No. 4842 I, derived from hybridization of the same two species, has a more compact habit than the two foregoing lines. These interspecific crosses are said to be also producing some quite new forms which may possibly be of economic value.

82. Production of Early Maturing Sea Island Cotton (U.S.S.R.). By A. V. Bereznjakovskaja. (*Jarovizacija*, **1** (34), 1941, p. 40. From *Pl. Bre.*

Absts., xii., **1**, 1942, p. 58.) Sea Island plants were grown under cover, but were subjected to low temperatures during the first stage of phasic development. The first generation progeny contained various anomalous forms, including some dwarfs which ripened very early, before the beginning of the frosts. These plants also had bolls which opened wide as in Upland cotton. Variation occurred in the entire population in respect of time of maturity. The 51 best plants were selected and their progenies were studied separately. Variation was again observed in time of maturity, some lines being up to 29, and odd ones even 35-40 days earlier than the control. The progeny of the dwarf plants were normal in habit and typical Sea Island plants, but were the earliest of all in maturity, some of them ripening 29 days before the control; when sown in the open on April 20 they ripened in 130-140 days. The treatment was applied again to some of these second generation plants; the progeny proved distinctly hardier than untreated plants, earlier in flowering by 1-19 days, and in ripening by 2-3 weeks. In ripening they were simultaneous with the Egyptian cottons. As regards other characters, including the quality of the lint, the plants were indistinguishable from ordinary Sea Island.

83. RUSSIA: REPLACE THE COTTON VARIETY 1306 BY BETTER VARIETIES. By P. Gattenberger. (*Sovetskii Khlopok*, **9**, 1939, p. 28. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) The variety 1306 is the earliest cotton grown and has enabled cotton cultivation to be extended northwards as far as latitude 50° N. Its lint, however, is exceedingly short, in poor years not exceeding 25 mm. In 1937 and 1938 certain new varieties were released which are about equal to 1306 in earliness, but distinctly superior in lint quality, size of boll, and many other features, including yield. The history of the variety 1306 and a number of variants of it is outlined, and there follow descriptions of the new improved types referred to. 1375 I, a selection from a local mixture, is 2-3 days earlier than 1306, its bolls are of medium size, the seed cotton per boll weighing 4 grm.; its ginning outturn is 32·0 per cent., which is 1 per cent. higher than in 1306; the lint is 27-28 mm.—*i.e.*, 1 mm. longer than that of 1306; the cotton does not shed from the ripe bolls. The quality of the lint of this cotton from unirrigated land was classed higher than any other, but it is somewhat more prone to gummosis than the other varieties. The 803, a selection from Karajaz-King, is very high in yield, bears large bolls giving 5-5·5 grm. seed cotton, has a ginning outturn of 34-35 per cent. and lint length of 28/29 mm.; the lint does not shed. This strain is 1-2 days later than 1306 in maturity, but is free from gummosis and quite suitable for replacing 1306 in certain areas. Variety OD 1, a selection from the F_4 of a cross between varieties 915 and 1306, has exceeded 1306 in yield, equals it in earliness and has large bolls yielding 4·5-5·0 grm. of seed cotton; it is free from shedding, the ginning outturn is 34-35 per cent. and lint length 27/28 mm.; it is less susceptible to gummosis than 1306. Variety 14958-4 is 3-4 days earlier than 1306, which it exceeds also in ginning outturn (34-35 per cent.); it is less prone to shedding and the bolls are somewhat bigger. This cotton is recommended for the most northerly districts of all; its lint, however, is 1·5-2·0 mm. shorter than that of 1306. Variety C 925, a product of individual plant selection from a mixture of Kirda, equals 1306 in earliness, produces 5 grm. seed cotton per boll, with a ginning outturn of 34-35 per cent., and lint length 29/30 mm.; it outyields 1306 by 6-35 per cent. The lint is pronounced to be of good spinning quality, being 2 mm. longer than 1306 and somewhat stronger.

84. RUSSIA: NEW COARSE-LINTED FORMS OF COTTON. By V. Kulebjaev. (*Sovetskii Khlopok*, **6**, 1939, p. 46. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 306.) With the object of producing large-bolled cottons yielding coarse lint, but capable

of being used as a wool substitute, crosses were made between Egyptian cottons (*Gossypium barbadense*) and perennial Peruvian cottons (*G. peruvianum*), which were induced to flower by treatment with a 10-hour day. The F_1 plants behaved as perennials, giving seed only when grown under curtailed illumination. The F_2 generation segregated into annuals and perennials and showed great variations in fertility, lint length and other characters. Segregation was also observed in the F_3 generation. Several plants of the annual, Egyptian type of habit, with coarse, woolly lint were selected; they were later than Pima in maturity. These plants are described; the first has white, woolly, strong lint 34-36 mm., base 45·4 per cent., uniformity 1498, strength 6·7 grm., and metric number 4343; the second has creamy, woolly, strong lint, 35-37 mm., base 41·7 per cent., strength 6·6 grm., metric number 5350. Some of the hybrids have bolls weighing 5-7 grm., and their lint is considered quite suitable for mixing with wool.

85. Cotton Breeding in the Kara-Kalpak, U.S.S.R. By G. Gavrilov. (*Sovetskii Khlopok*, **3**, 1940, p. 39. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 304.) Early varieties were crossed with varieties possessed of other desirable qualities. In the F_1 only those plants equal or superior in earliness to the early parent were selected. In this way the variety C-925 was produced, which in 1938 yielded 32 c. per ha. as compared with 20 c. from the standard variety 1306. This new variety and C-2186 from the same cross have also excelled the existing varieties in spinning tests, the results of which are recorded.

86. South American Cottons. (*Man. Guar.*, 27/2/42.) The United States is likely to be the second largest importer of East Indian cotton during the current season, offsetting part of the loss through the closing of the Japanese outlet. It remains to be seen whether the development of inter-American trade will make the United States an important outlet for South American cottons, but it may be noted that this possibility is not mentioned in a recent survey of the position by the U.S. Dept. of Agriculture. This reports that cotton exports from Latin America have been declining steadily since the beginning of this season. Japan and China have been, during the last two or three seasons, the principal markets for most of the Central and South American countries which produce cotton surpluses, including Brazil, Argentina, Peru, Paraguay, Mexico, Haiti, Salvador, and Nicaragua, but most of the 1940-41 crops were disposed of before December 7, and stocks are not yet heavy except in Brazil and Peru. In those two countries, and in Argentina and Paraguay, Government loans or other price-supporting measures are already in operation. Brazil's crop in 1940-41 was 2,557,000 bales—a high "record"—and the carry-over on August 1 was 1,553,000 bales. The current crop is expected to be of much the same size as last season's, so that there will be a serious storage problem when it begins to move from up-country in March. Peru lost most of its continental markets at the outbreak of war, and its cotton carry-over at January 1, 1941 was 208,000 bales, a new high "record." Larger shipments to the Far East last year brought some decrease of stocks, but the carry-over at the beginning of this year, at 150,000 bales, was double the normal amount. The new crop is mainly picked between May and August, so that in Peru, also, there will be a heavy strain on warehouse facilities. The Argentine crop last season was small, being only 232,000 bales, or only 40,000 bales above local consumption. The current crop is understood to have suffered heavy damage through drought and frost, so that no large accumulation of stocks is likely there, while Mexico will probably also consume most of its own production, and Paraguay has only a small surplus.

87. Thailand: Cotton Production. (Dept. Agr. and Fisheries, Bangkok, *2nd Ann. Rpt. Cott. Exp. Sta.*, 1937-38. From *J. Text. Inst.*, xxxii., **10**, 1941, A434.) Meteorological data and particulars of insect pests and diseases are

given and field trials are reported. The standard variety in cultivation is Cambodia, and early strains with good yield and resistance to jassids are being developed. In variety trials Punjab-American produced the highest yield, followed by Mexican Big Boll and Trice.

SOILS, SOIL EROSION AND MANURES.

88. Soils and Soil Management. By A. F. Gustafson. (McGraw-Hill Publishing Co., Ltd., London, 1941. Price 21s. From *Bull. Imp. Inst.*, xxxix., 3, 1941, p. 277.) This volume is written mainly for the use of the American student to provide a textbook on practical soil management, but it is also hoped that it will find a use in the wider field among those concerned with the ownership or utilization of land. Soil management and the various aspects of manuring are dealt with in detail, but it has only been possible to give an outline of the important subject of soil conservation. The author deals not only with the scientific problems relating to the soil, such as physical properties, soil organisms, humus, the functions of fertilizers, and so on, but also with such essentially practical questions as drainage and irrigation, tillage and rotation of crops. The work is provided with some excellent illustrations and contains many tables, while frequent references to literature occur as footnotes in the text.

89. Bibliography of Soil Science, Fertilizers, and General Agronomy, 1937-40. (Imperial Bur. Soil Science, Harpenden, England, 1941. Price 25s. From *Pl. Bre. Abs.*, xii., 1, 1942, p. 85.) The Imperial Bureau of Soil Science has compiled this bibliography by rearranging the references in Vols. I. to III. of "Soils and Fertilizers." It therefore also serves as a cumulative index to those volumes. The main part of the book is taken up by the bibliography, which is divided into two parts—main and geographical. At the beginning is an index to the classification numbers, being in effect extracts from the Universal Decimal System. The complement to this, the subject index, appears at the end of the book, and an author index is also provided. A list of abbreviations of the names of journals is given.

[*Cf.* Abstr. **646**, Vol. XV. of this Review.]

90. Save the Soil with Contour Farming and Terracing. By E. W. Lehman and R. C. Hay. (*Ill. Agr. Coll. Ext. Circ.* 513, 1941. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 448.) Emphasizes the well-known advantages of contour farming and terracing and presents practical information on systems of contour ploughing and planting, planning contour and terrace systems, locating and marking the lines, grass waterways and terrace outlets, constructing the terraces, maintaining a terrace system, and the cost of terracing. An appendix deals with the use and care of the level.

91. Soil Investigations by the Arizona Station. (*Ariz. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 589.) Progress in soil science research is reported on the soil changes which accompany water spreading, influence of organic matter decomposition on the physical and chemical properties of some Arizona soils, oxidation-reduction potentials of semi-arid soils, moisture relations in puddled soils, development of a capacitance bridge or soil-moisture meter, development of acidulated fertilizers through the use of a small amount of sulphur, a method for determining soil *p*H, and improved soil practices for cotton.

92. Soil Erosion in Trinidad and Tobago. By F. Hardy. (*Trop. Agr.*, xix., 2, 1942, p. 29.) Soil erosion in these islands is mainly insidious sheet erosion, which is variably affecting both sloping ground and flat alluvial lands. In

addition, clay soils within wet areas are subject to land-creep and land-slip movements (namely soil-creep, earthflow and débris avalanche; slump, débris-slide and débris-fall). Erosion in Trinidad and Tobago is described in this paper for each of the main topographical divisions—*i.e., Trinidad:* the Northern Range, Northern Plain, Central Range, Southern Plain, Southern Range, and Cedros Peninsula; *Tobago:* the Highland and the Lowland Regions. Soil conservation in the islands has not yet been systematically practised, nor has adequate publicity been afforded to it by competent authority. The co-operation of planters and landowners is essential in any attempt to stop further depredation.

93. Effectiveness on Cotton Soils of Granulated Mixed Fertilizers. By J. J. Skinner *et al.* (*Amer. Soc. Agron. J.*, **33**, 4, 1941, p. 314. From *Cott. Lit.*, July, 1941, p. 266.) Granulated complete fertilizers of 4 to 6, 5 to 10, and 10 to 20 mesh size were compared with powdered and standard materials of the same composition when applied to cotton at five locations in North Carolina, South Carolina, and Georgia during a 3-year period. There was slightly less soluble salts in the soil of the seed zone when granulated fertilizers were used, the quantity decreasing with increase of particle size, but this variation did not significantly affect plant emergence. There was a trend below the level of significance for the larger granules to increase the yield of seed cotton.

94. Cotton Plant: Response to Minor Elements. By A. L. Sommer. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 94. From *J. Text. Inst.*, xxxiii., **2**, 1942, A61.) When grown in greenhouse pot cultures on 16 Alabama soils cotton responded equally to both Mg and " minor " elements.

95. Cotton Plant: Effect of Soil *p*H. By W. R. Paden. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 93. From *J. Text. Inst.*, xxxiii., **2**, 1942, A61.) Cotton on sandy loam at *p*H 5·5 or 5·0 made very slow growth as seedlings, and was highly susceptible to cold and insect injury by comparison with the vigorous growth and earlier maturity on plots at *p*H 6·0 or 6·5. The relative yields of seed cotton at *p*H 5·0, 5·5, 6·0 and 6·5 were 100, 112, 118 and 122 respectively.

96. Neutral *v.* Acid Fertilizers. By C. Dorman. (*Miss. Farm Res.*, iii., 9, 1940, p. 8. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 302.) Adding about 500 lb. of dolomite limestone to each ton of an otherwise acid-forming 4-8-4-fertilizer cost about 30 ct. per acre, practically eliminated soil acidification, and increased the seed-cotton yield by about 90 lb.

97. Fired Soil as Fertilizer. (*Ind. Frmg.*, October, 1941, p. 530.) In the absence of proper soil management the heavy soils of India, such as the black cotton soils, very easily lose their tilth on wetting, and investigations have been carried out at the Institute of Plant Industry, Indore, to control this loss of tilth under field conditions. Encouraging results have been obtained by the use of lightly-fired soil, which does not become sticky when moistened with water, and which has proved markedly beneficial to cotton. A simple technique is given for the preparation of the fired soil.

98. Cotton Plant: Response to Potash. By N. J. Volk. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 55. From *J. Text. Inst.*, xxxiii., **2**, 1942, A61.) Data from supposedly uniform experimental plots are used to demonstrate the difficulty of correlating the replaceable K content of the soil with yield responses when cotton is the crop.

99. Cotton Plant: Fertilizing with Gypsum. By E. D. Matthews. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 95. From *J. Text. Inst.*, xxxiii., **2**, 1942, A61.) Ordinary superphosphate proved superior to triple superphosphate

as a fertilizer for cotton so long as little sulphate was also supplied. Gypsum increased the yield when used as source of sulphate with triple superphosphate, but when there was plenty of ammonium sulphate at hand the use of gypsum caused the yield to decline.

100. EVIDENCE OF THE VALUE OF THE SODIUM ION IN COTTON FERTILIZERS. By E. D. Matthews. (*Georgia Sta. Circ.* 127, 1941. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 341.) In fertilizer experiments with cotton, 1939-40, the crop receiving 600 lb. per acre of 5-10-5 fertilizer including N one-half as sodium nitrate and one-half as ammonium sulphate, averaged 945 lb. seed cotton per acre, and that receiving N as ammonium nitrate 890 lb., the difference apparently due to the Na ion. Other studies showed that Na is of distinct value to cotton on soils which respond to potash fertilization, as Clarksville gravelly silt loam, but of no benefit on soils plentifully supplied with potash, as Decatur clay loam. Benefits from Na, where they exist, may be about 40 per cent. as much as benefits from equivalent amounts of K.

101. RELATION OF FERTILIZER BALANCE TO POTASH HUNGER AND THE *Fusarium* WILT OF COTTON. By V. H. Young and W. H. Tharp. (*Bull. Arkansas Agr. Exp. Sta.*, 410, 1941. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 74.) In investigations conducted in Arkansas from 1937 to 1939 the cotton varieties Cook, Rowden 2088, and Half-and-Half were planted on fine alluvial soil in which cotton in earlier years had been seriously infected with *Fusarium* wilt (*F. vasinfectum*) and had shown marked symptoms of potash deficiency (rust). Nine different fertilizer treatments, based on 600 lb. of 6-8-6 (nitrogen, phosphorus, potassium) fertilizer per acre were tested, the proportions of the elements being varied to provide a series of complete and incomplete fertilizer combinations. The mean wilt intensities for the three varieties during the whole period were 2·74, 6·03, and 55·66 per cent. respectively. The effect of any treatment on any one variety was, however, similar to that on the other two. Thus, combinations with the least amount of potash (6-12-4) gave effective control of rust and conspicuously reduced wilt. The heaviest amounts of potash (6-12-12 and 0-4-12) gave the best control of wilt. Unbalanced applications (unfertilized controls, 6-8-0 and 0-8-0) increased wilt and induced pronounced rust. Phosphate used alone caused increased wilt, as compared with the non-fertilized controls. All the fertilizers except phosphate alone (0-8-0) gave highly significant yield increases on Half-and-Half. The highest potash application (6-12-12) gave better results than one in which the potash was reduced to one-third of this amount. Under the conditions of the experiment, potash applications gave definite control of rust (potash hunger) and very marked control of wilt, whereas high applications of nitrogen and phosphate, and of phosphate without potash, were either ineffective or detrimental. Increased susceptibility to attacks of *F. vasinfectum* was associated with increased severity of potash-deficiency symptoms.

102. THE EFFECT OF FERTILIZATION AND CULTURAL PRACTICES ON THE OIL AND AMMONIA CONTENT OF COTTONSEED GROWN ON YAZOO-MISSISSIPPI DELTA SOILS. By M. Gieger. (*J. Agr. Res.*, **63**, 1, 1941, p. 49.) Samples of cottonseed were collected annually over a 5-year period from 1933 to 1937 inclusive on plots of Sarpy loam located at the Delta Branch Experiment Station, Stoneville, Miss., which had received for a 10-year period prior to the first sampling the following treatments: (1) Commerical fertilizers, which included nitrogen, phosphorus, and potash; (2) green manures, which included hairy vetch, Austrian winter peas, sweet clover, bur clover, and rye; and (3) a variety of cultural practices, which included (*a*) different methods of seedbed preparation—namely, no ploughing, bedding in the fall, bedding in the spring, bedding in the fall and

rebedding in the spring; (*b*) uniform seedbed preparation followed by different methods of cultivation, which included hoeing only, harrowing only, cultivating 3 in. deep, 6 in. deep, 6 in. deep followed by 3 in. deep; and (*c*) variations in number of plants per hill with uniform spacing between hills.

The percentage of oil and ammonia was determined on all samples of cottonseed, with the following results: (1) Nitrogenous fertilizers decreased the percentage of oil in the seed but increased the percentage of ammonia; (2) phosphorus and potassium when used separately gave no increase in oil percentage, but when used together gave a slight increase, although its significance may be questioned; the percentage of ammonia was unaffected in either case; (3) green manures, like commercial fertilizers, increased the percentage of ammonia and decreased the percentage of oil on the basis of their nitrogen content. The different methods used in preparing the seedbed, cultivating and spacing, showed little if any influence on the percentage of oil and ammonia in the cottonseed. The quantity of oil and ammonia produced per acre was influenced somewhat by the different cultural practices, but any advantage of one practice over another is better measured by the quantity of oil and ammonia produced on the basis of acre yield than by the percentage of oil and ammonia in the cottonseed. Nitrogen in whatever form applied increased the ammonia content of the cottonseed.

103. MISSISSIPPI: VALUE OF DOLOMITE FOR COTTON ON BROWN LOAM SOILS. By J. Pitner. (*Miss. Farm Res.*, August, 1941, p. 8. From *Cott. Lit.*, September, 1941, p. 351.) An increase in yield of 187 lb. of seed cotton per acre resulted from the application of 500 lb. dolomite in combination with 500 lb. of 6-8-8 per acre as the average of 4-year results from tests carried out on a farm at Benton, Mississippi.

104. MISSISSIPPI: THE INFLUENCE ON COTTON PRODUCTION OF NITROGEN, PHOSPHORUS, AND POTASSIUM, AND THEIR COMBINATION. By J. L. Anthony and J. Pitner. (*Miss. Sta. Bull.* 357, 1941. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 341.) Fertilizer tests with cotton during six years in co-operation with farms and sub-stations involved 400 lb. per acre rates of the 4-8-4, 0-8-4, 4-8-0, and 4-0-4 combinations on different soil types in the hill sections of Mississippi. Most, although not all, soils of sandy texture appeared to need N, P, and K for maximum economical cotton production. Soils of silt or clay texture were found to vary widely in response to combinations of fertilizers, some requiring NPK and others PK or NK for best results. Costs of fertilizer treatments and estimated profits per acre are given for each experiment. Since such wide differences exist among soils and even between soils on any one farm, all fertilizer recommendations are deemed of a general nature and must be adapted by the farmer to his own requirements and conditions. Simple field tests are outlined for farmers desiring to determine their specific fertilizer needs.

105. MISSISSIPPI: PROFIT FROM $100 SPENT FOR COTTON FERTILIZER. By W. B. Andrews. (*Miss. Sta. Bull.* 342, 1940. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 325.) Experimental data on the effects of formulas and rates of fertilizers for cotton on profits obtained in the hill sections of Mississippi are given in detail for several agricultural areas, and summarized. Recommendations based on the data and other available information are for limestone uplands 200 lb. each of ammonium sulphate and of superphosphate, Brown loam upland 600 lb. of 4-8-4, all other uplands 500 lb. of 6-8-4 or 450 lb. of 8-8-4, and silt and sandy loam first and second bottoms 600 lb. of 4-8-8 fertilizer. Modifications of the rates and formulas and of the suggested home mixtures are indicated for special conditions. Using 1,200 lb. per acre of 4-8-4 fertilizer, costing $15·94 when factory mixed and $12.64 when home mixed, was more profitable than 600,

1,800, or 2,400 lb. on all soils except the Brown loam upland, on which 600 lb. was most profitable. Comments are also made on methods of applying fertilizers, which depend on the rate per acre and the soil; the need of all soils for nitrogen, but not necessarily the recommended quantity of phosphorus and potash; the effect of depression years on the ratio of nitrogen, phosphorus, and potash applied; and the influence of fertilizers on the available lime, phosphorus, and potash in the soil.

106. Fertilizer Experiments with Acala Cotton on Irrigated Soils. By D. A. Hinkle and G. Staten. (*New Mexico Sta. Bull.* 280, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 756.) Fertilizer tests with Acala cotton grown continuously on an irrigated Gila clay adobe soil, 1929-40, are reported. Annual acre applications of 135 lb. of treble superphosphate or 150 lb. of ammonium sulphate did not materially affect yield, staple length, lint percentage, boll size, or maturity of cotton grown on this heavy soil. Their combination increased yields slightly but not profitably. Annual applications of manure resulted in an average increase of 143 lb. of lint cotton per acre over unfertilized plats, a significant and paying response. None of the fertilizer treatments used reduced the percentage of diseased (*Verticillium* wilt) plants, which were most numerous on the lighter-textured soil areas of the field. Fertilizers used alone or in combination did not materially affect the total N, organic matter, or reaction of the surface or subsurface soil. Those containing P increased the available phosphate content. Use of manure increased total N, organic matter, and available P of the soil, but did not affect the reaction. In a second test on a lighter type of soil, 1937-40, a small response was obtained from either ammonium sulphate or superphosphate and a very good one from 16-20-0 Ammo-Phos. Annual applications of manure resulted in the greatest response even when manure supplied about the same amount of plant food as the commercial fertilizer, and also produced a much greater percentage increase in yield on poor light soil than on heavy soil. Comparisons of different kinds of S on a very heavy plastic soil failed to show an increase in cotton yield compared with unsulphured plats.

107. Texas: Tests of Nitrogenous Fertilizers for Cotton. By E. B. Reynolds. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 61.) Of the five materials included in the test in 1940, sulphate of ammonia and uramon made the largest yields—215 and 313 lb. lint per acre respectively. During the last nine years, however, nitrate of soda has produced the highest acreage yield—269 lb. lint per acre, which is only slightly higher than the yield of 258 lb. from soil treated with sulphate of ammonia. This slight difference in yield is probably not significant.

108. Cotton Seedlings: Effect of Boron. By J. R. Piland. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 95. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 25.) The boron content of North Carolina soils is discussed. Cotton seedlings were injured if planted immediately after the addition of more than 1 p.p.m. of boron to the soil, but if planted after soy beans were not injured in a soil containing 0·96-1·44 p.p.m.

109. Compost. (*Farmg. in S. Afr.*, September, 1941, p. 299.) Discusses methods of preparing compost, and gives the following brief description of a method successfully applied at co-operative demonstrations in the irrigated areas of Upington, Rust-der-Winter, Rustenburg, and Marico, South Africa, during the past two seasons: Wheat straw soaked for 2-3 days in a hole filled with water, and subsequently worked into heaps 6 feet wide. On each 1-foot layer of straw 3 inches of kraal manure are spread, or a 2 : 2 : 1 mixture of ammonium sulphate,

agricultural lime, and superphosphate respectively (at the rate of approximately 120 lb. per ton of dry material), is strewn on the wet material and worked in with a pitchfork. In this manner a heap 6 feet high is built up. It was found unnecessary to add more water or to turn the heaps. After approximately two months the straw was sufficiently decomposed for use.

110. The Manufacture of Humus. By H. M. L. (*Madras Agr. J.*, March, 1941, p. 112.) A useful description of "what humus is and how it is prepared," and including also a description of the Indore process.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

111. Statistical Theory of Estimation. By R. A. Fisher. (Calcutta Readership Lectures, 1938. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 334.) This booklet contains a series of lectures given to the Statistical Conference at Calcutta in 1938. It is based on the author's own publications during the years when he developed his theory of estimation. This theory is concerned with achieving maximum precision in the estimation of what are called parameters. For example, if we wish to estimate the value of the recombination fraction from observed frequencies with which the phenotypes have occurred, or we may have to estimate the nitrogen contents of barley corn in a field from that in samples analyzed, or we may wish to calculate the parameters in Mitschlich's law of diminishing returns from the observed response of yields to the application of manure at increasing levels. It is shown how the method of estimation varies in accordance with the statistical distribution law which the observed data follow. If this law is known, the theory provides a means of estimating where possible the parameter sought with maximum precision (calculation of "sufficient statistic"). In cases where a "sufficient statistic" cannot be found the theory yields the loss in precision which arises through using a less "efficient statistic" for the estimation. In this booklet the author confines himself to giving the general theory, which is developed in masterly briefness and conciseness. It is assumed, however, that the reader is acquainted with certain results of advanced calculus. Details of the application of the theory to particular cases are to be found in numerous papers by the author and others.

112. Behrens' Integral: Asymptotic Approach. By R. A. Fisher. (*Ann. Eugenics*, **11**, 1941, p. 141. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 53.) A certain amount of confusion and controversy has arisen in respect of the test of significance, first given by Behrens, for the difference between the means of two samples not supposedly drawn from equally variable populations, or from populations having a known variance ratio. In such cases not only a single hypothetical variance, but the ratio of two such variances, require to be "Studentized," or eliminated, by means of its fiducial distribution. In the present paper the logic of this and analogous inferences is examined.

113. The Analysis of Incomplete Split Plot Designs. By P. V. Krishna Ayyar. (*Sci. and Cult.*, **6**, 1941, p. 487. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 252.) The split plot technique in field experiments provides for two experimental errors (*a*) and (*b*), one for the comparison of main treatments (usually differences in field cultivation) and the other for the more accurate test of subtreatments (usually manurial), and the interactions. Whilst the analysis of a *complete* split plot design follows straightforward lines of analysis of variance, a difficulty arises in the separation of the two errors in an *incomplete* split plot design. Following the customary technique of fitting constants to represent

treatment and block differences, the author subtracts the variation between these constants from the total sum of squares to obtain as a residual the compound error (*a*) plus (*b*). To split this into its components it is sufficient to estimate error (*b*). To this end all main plots are grouped so that plots with the same main treatment are in the same group, each group being regarded as a separate hypothetical experiment. For each group the residuals are then calculated by the standard method of fitting constants, and pooled to form the sum of squares of error (*b*). The degrees of freedom are split correspondingly.

114. The Analysis of Quasi-Factorial Designs with Incomplete Data. 2. Lattice Squares. By E. A. Cornish. (*J. Aust. Inst. Agr. Sci.*, **7**, 1941, p. 19. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 1.) There are two types of statistical analysis dealing with incomplete data. The one (of which the well-known missing plot technique is an example) deals with experiments where the data referring to a single plot (or a number of plots with random positions) are missing or unreliable. The other deals with cases where the missing plots constitute a definite experimental group such as the plots in a row of Latin Squares or the set of plots treated alike in a randomized block experiment. In this paper of his series the author deals with incomplete data of the latter kind and considers Lattice Squares (quasi-Latin-Squares) in which a complete row (column) is missing or where all data referring to a treatment are lost or unreliable. Formulæ for the analysis of variance are derived by the standard method of fitting constants. Whilst the case of a " missing treatment " is comparatively easy, the analysis of a Lattice Square with a missing row (column) is complicated; the comparison of the yields of plots under the two different treatments has to be carried out in separate groups according to their position relative to the missing row (column).

[*Cf.* Abstrs. **111**, **112**, **375**, Vol. XVIII. of this Review.]

115. Binomial Distributions: Fitting. By J. B. S. Haldane. (*Ann. Eugenics*, **11**, 1941, p. 179. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 53.) The author shows that a binomial law can readily be fitted to observed data by the method of maximum likelihood.

116. Comparaison de Différentes Méthodes d'Expérimentation Phytotechnique. By J. S. Papadakis. (*Rev. Argent. Agron.*, **7**, 1940, p. 297. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 262.) The author develops a new method of comparing the efficiency of field designs. The comparative effectiveness of different methods of local control depends on the fertility trends on the experimental site. Thus, in the case of two definite trends (lengthways and across the field) a Latin Square will be more effective than a randomized block method, whilst for " patchiness " the randomized blocks will often achieve better local control. With the author's methods fertility trends are classified by certain characteristic values which could be obtained from the yields of a uniformity trial on the site. These characteristics are: r_k the correlation between (yields of) plots in the same block containing k plots, r_l and r_c the respective correlations between plots in the same row or column, r_1 the correlation between neighbouring plots and r_2 the correlation between plots in the same row or column but separated by one plot. The experimental errors in various designs such as randomized blocks, factorial designs (with two or three factors), incomplete randomized blocks of various types, are expressed in terms of the above characteristics. The idea is an extension of the conception of R. A. Fisher's intracorrelation, and the author has developed a new technique of local control which makes use of the above correlations r_1 and r_2. In the simplest case the idea is roughly to use every second experimental plot, called test plot (témoin), to construct a fertility distribution of the experimental site and then to correct the remainder of the

plots, the "non-témoins," for local fertility. To this end deviations from respective treatment means are taken for all test plots, and the correction to each non-témoin yield is then given by the mean deviation in the two adjacent test plots. The resulting error of the corrected yields depends on the correlation r_1 and r_2. For certain fertility trends the author's method is more efficient than standard designs, and the author is able to demonstrate this with the help of data obtained in a uniformity trial in the Punjab. These data are also used as an example for the calculations of the experimental error by the new method. One difficulty about the new method is that corrections applied to the yields of two neighbouring "non-témoin" plots are not independent; moreover, treatment mean square and error mean square are not orthogonal. Standard tests of significance are therefore not applicable. The author does not consider the question of significance. If the appropriate test can be evolved at all it would certainly be complicated.

117. Some Problems in Handling and Interpreting Plant Disease Data in Complex Factorial Designs. By W. R. Tharp *et al.* (*Phytopathology*, **31**, 1941, p. 26. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 262.) Data on the incidence of plant diseases are often expressed as percentages (such as the percentage of plants affected), and are therefore liable to follow distribution laws which differ from the normal curve. The authors have encountered this difficulty in an experiment designed factorially to study N-, P-, K-nutrition of three varieties (Cook 307, Rowden 2088 and Half-and-Half) of cotton in relation to their comparative resistance to *Fusarium* wilt in sand culture in a greenhouse. Two difficulties arise. Firstly, there is heterogeneity in the variance, since a susceptible variety (like Half-and-Half) will show considerable variation in wilt incidence under different nutritional conditions, whilst the variety Cook 307 (considered wilt-resistant) will show little variation. Secondly, the recorded data will not be normally distributed. This latter difficulty is usually overcome by a transformation of the data prior to the analysis of variance. The customary transformations are applied to the data, but only the logarithmic one diminishes the heterogeneity of variance significantly. Moreover, the study of interactions on "the logarithmic scale" has a practical meaning, whilst interactions are only of academic interest where angular and square root transformations are used. As an alternative to transformations, the authors discuss methods of splitting the heterogeneous variance into homogeneous components. With an analysis of this kind, each treatment effect is tested against its own experimental error, so that there is some loss of experimental accuracy. Two important aspects have been ignored. One is the possibility of modifying the test to account for heterogeneity and non-normality. Secondly, no precautions have been taken to safeguard against biassed significance through selection. With as many as 29 interactions set out in Table 4 of the paper one would expect that one or two in the sample of mean squares will exceed the 5 per cent. point of significance, even if none of the interactions is real.

118. Cottonseed Disinfection in War-time. By A. S. Boughey. (Abstr. from *Nature*, 10/1/42.) In the Sudan cottonseed has to be treated with a mercurial dust for the control of blackarm (*Bacterium malvacearum*), present in the seed as an external infection. On the outbreak of war the possibility arose of there being a shortage of mercurial dusts in the country, and it became expedient therefore to provide an alternative method for the disinfection of cottonseed in the event of such an emergency. *B. malvacearum* in cotton débris is destroyed when cotton fields are flooded for a period of 4 days with irrigation water. The disappearance of the organism is attributed to the action of a bacteriophage. Experiments were performed to discover whether *B. malvacearum*

on cottonseed could be destroyed in a similar manner. It was found that after steeping cottonseed for 48 hours in four times its own weight of irrigation water practically all traces of external infection by *B. malvacearum* had disappeared. In small-scale plant-house experiments on seed which when untreated gave 14 per cent. infected plants, complete control of the organism was obtained. A larger field experiment, using infected seed from the same source, gave 0·26 per cent. infected plants after the steeping treatment, and complete control after using a mercurial dust, Abavit B. Germination of the seed is depressed by the steeping treatment, but not seriously so. In a field experiment unsteeped seed gave 79 per cent. germination, and steeped 72 per cent. The steeped seed had been dried and stored for a short period after treatment. If the steeped seed cannot be sown wet immediately, and has to be dried and stored, the drying process must be rapid and thorough, otherwise the seed will promptly germinate. From laboratory experiments it would appear that the organism disappears from the surface of the seed during steeping, not through the activity of a bacteriophage, but through exposure to anaerobic conditions. These conditions are the result of bacterial activity, and oxygen absorption by the germinating seeds. The growth of *B. malvacearum* in culture is closely conditioned by the amount of oxygen present.

119. Cottonseed: Effect of Sterilization on Germination. By C. H. Rogers. (*Proc. Assen. S. Agr. Wkrs.*, **42**, 1941, p. 193. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 26.) A series of experiments are reported in which nine organic Hg compounds, delinting with sulphuric acid, three combinations of delinting and dusting with Hg compounds, and yellow and red Cu oxides were compared for their effects on germination and the yield of cotton. The copper oxides gave poor results, but the other treatments improved germination by 5-45 per cent. and reduced seedling infection by 3-20 times. Delinting was particularly useful. The incidence of angular leafspot disease over a 4-year period was reduced from 41 to 7 per cent. by dusting with Ceresan or by delinting with acid.

120. Cottonseed Disinfectants: Efficiency Tests. By D. C. Neal. (*Proc. Assen. S. Agr. Wkrs.*, **42**, 1941, p. 197. From *J. Text. Inst.*, xxxiii., **2**, 1942, A62.) Results of tests on proprietary organic mercury compounds, ethyl mercuriborate, cyanamide and copper-mercury dust are reported.

121. Cottonseed Delinting Machine. Chemical Seed Treating and Delinting Corporation. (U.S.P. 2,240,503 of 15/7/37. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 516.) The claim is for a machine in which cottonseed travels continuously first on an inclined frame through an acid bath where the lint is removed, then through a washer where loose lint and excess of acid are removed, then through a " floater " where trash and defective seeds are skimmed off, and finally through a dryer. Movement through the various sections is provided by rotary means.

122. Cottonseed Delinting Machine. Hoefling Bros. (Sacramento, California. U.S.P. 2,242,302 of 15/1/40. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 536.) The seed is fed into a cylindrical casing in which is a rotary brush with long, resilient bristles, and a current of air from a fan is directed tangentially to the brush against the direction of rotation. The lint passes away with the air and the seed emerges from a hole at the bottom of the casing.

123. A Device for Converting Small Cotton Gins for Use in Delinting Cottonseed. By W. W. Ballard. (*Ga. Sta. Circ.* 129, 1941. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 101.) To provide means for delinting, for experimental purposes, smaller quantities of seed than can be handled in commercial machines, the author devised mechanical attachments for converting the small 10- to 20-saw gin into a seed delinter. The parts required are: (1) A revolving float, or 4-inch

cylinder, carrying four 0·75-inch angle-iron flanges, operating inside the roll box, to keep the seed roll spinning while the gin is in operation; (2) a special seed grid designed to prevent seed from being thrown out of the roll box until delinting has been completed; and (3) a curved baffle plate attached to the top of the roll box to reduce the feed opening and prevent bulging of the seed roll as it revolves. No permanent alteration to the equipment interfering with normal operation of the gin is involved. The special parts required for delinting may be easily removed and the standard parts replaced in a few minutes.

124. Cotton Gin Air Intercepting Valve. Lummus Cotton Gin Co. (U.S.P. 2,235,017 of 1/10/40. From *J. Text. Inst.*, xxxii., **10**, 1941, A442.) The claim is for a combination of gins, a mote conveyor extending along and through them, a housing for the conveyor between adjacent gins, and air-intercepting valves in the housing.

125. American-Egyptian Cotton Quality and Ginning. By A. J. Johnson *et al.* (*U.S. Dpt. Agr., Agr. Mktg. Serv.*, 1941. From *Cott. Lit.*, December, 1941, p. 497.) Summarizes information obtained through experiments and surveys conducted in connection with the ginning of American-Egyptian cotton by the U.S. Dept. of Agriculture and other agencies.

126. Ginning of Sea Island and American Cotton in 1940. By F. L. Gerdes. (*Cott. and Cott. Oil Press*, **42**, 17, 1941, p. 11. From *Cott. Lit.*, September, 1941, p. 357.) Ginning preparation of the two types of cotton and facilities for ginning extra long staple cotton are discussed.

127. Baling Press. Lummus Cotton Gin Co. (U.S.P. 2,241,063 of 9/1/39. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 516.) A baling press with separable doors has two of the doors pivotally mounted on a supporting member, a hydraulic piston fast on one door surrounded by a cylinder, and link means connecting the hydraulic cylinder with the other door. By forcing a fluid into the cylinder the doors are held assembled.

128. Cotton Bale Press Retainer Control. Gullett Gin Co. (Amite, La., U.S.A.; U.S.P. 2,237,721 of 24/11/39. From *J. Text. Inst.*, xxxii., **10**, 1941, A442.) A baling press has press boxes that can swing about a supporting post to come alternately under a tramper and a ram. Retainer units are mounted along the sides of the boxes, comprising a vertical shaft and lateral retainers extending at intervals at one side of it. A system of levers and balancing weights is provided so that the retainer units are in position when the press box is under the tramper, but swing free at other times.

129. The Compression of Cotton, and Related Problems. By J. W. Wright and C. A. Bennett. (*U.S. Dpt. Agr., Agr. Marktg. Serv.*, 1940. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 110.) The development, distribution, and organization of the industry, the types of equipment, volume of cotton handled, rates charged, distribution of the cotton from the compressors, and the special problems associated with compression, are discussed.

COTTONSEED AND OIL.

130. Cottonseed, Soybean and Peanut Oils: Removal of Finely Dispersed Colloidal Colouring Substances. By R. H. Fash. (U.S.P. 2,229,062 of 21/1/41. From *J. Text. Inst.*, xxxii., **10**, 1941, A496.) Finely dispersed colloidal material remaining in the oil after preliminary refining is removed by treatment with X-rays or ultra-violet rays to reduce the state of dispersion of the colloidal material to be removed.

131. Determination of Gossypol in Crude Cottonseed Oil. By H. D. Royce *et al.* (*Indus. Eng. Chem.*, Analyt. Ed., **12**, 12, 1940, p. 741. From *Cott. Lit.*, July, 1941, p. 294.) A mixture of pyridine and aniline is more effective than aniline alone in precipitating gossypol from crude cottonseed oil. A modification of the pyridine-aniline method, which recovers up to 96 per cent. of gossypol from a 0·2 per cent. solution in oil, is described.

132. Molecular Distillation and Low Temperature Crystallization of Cottonseed Oil and the Stability of the Molecularly Distilled Fractions. By R. W. Riemenschneider *et al.* (*Oil and Soap*, **17**, 7, 1940, p. 145. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 294.) Molecular distillation of 1,400 gm. of the oil showed a small degree of fractionation of the glycerol esters. Unsaponifiable material was largely concentrated into the first fraction. Fractional crystallization from acetone at various temperatures ranging from 0° to − 65° C. gave results indicating that crystallization methods may be used to advantage in connection with other physical and chemical methods for the separation of the oil components.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

133. Advances in Entomology. By C. H. Richardson. (*Indus. Eng. Chem.*, News Ed., **19**, 2, New York, 1941. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 483.) Gives brief notes on results recorded in 178 papers dealing chiefly with recent work on insecticides, and thus serves as a useful index to the literature concerned. It is arranged under the following headings: Stomach Poisons: Contact Poisons; Control of Termites and other Wood-Infesting Insects; Insecticides of Plant Origin; Wetting and Spreading of Sprays; Fumigants; Attractants and Repellents; Methods for Testing Insecticides and Evaluating Toxicological Data; Reviews.

134. Entoma: A Directory of Insect Pest Control. By C. C. Hamilton (Editor). (Eastern Br. Amer. Ass., Econ Ent., New Brunswick, N.J., 1941. Price $1.00. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 438.) The lists in this fourth edition have been considerably expanded. In addition to those previously included, it now contains lists of moth-proofing testing laboratories, firms engaged in vacuum fumigation, dusting and spraying from aircraft and the production of motion-picture films of insects, trade-marked insecticides, fungicides and adjuncts, insecticide and fungicide manufacturers, the agricultural experiment stations of the United States, and entomological societies in the United States and Canada. The introductory survey of insecticides includes notes on several materials that have shown promise in recent research.

135. Entomophagous Insects. By C. P. C. Clausen. (McGraw-Hill Pubg. Co., Ltd., London, 1940. Price: £2 9s. From *Rev. App. Ent.*, xxix. Ser. A, **9**, 1941, p. 431.) With the growth of interest in the method of biological control of insect pests, the literature dealing with insect parasites and predators has assumed formidable proportions. Important contributions have been made by workers in many different countries, so that the student has access to only a small fraction of the published material. The author has therefore sought to make this work a comprehensive survey of the biology and host relations of the various kinds of entomophagous insects, designed to be of value to investigators engaged in field work on insect parasitology and the biological control of insect pests. The book is divided into sixteen main sections, each dealing with a separate insect Order; that dealing with the Hymenoptera occupies about half of it. Families are considered separately, individual species being cited as examples, and those containing parasites, in which the host relationships are highly specialized

and the immature stages show considerable morphological adaptation to their mode of life, are treated at greater length than those containing the more generalized predators. Full references are given for the information cited in the text.

136. A Factorial Experiment Comparing Insecticides for Control of Cotton Insects. By J. C. Gaines. (*J. Econ. Ent.*, **34**, 4, 1941, p. 512. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) A report of a 36-plat factorial experiment conducted in the Brazos River Bottoms near College Station, Texas, to secure information on the value of insecticides used in a schedule of applications for the control of cotton insects. Comparisons between the several treatments—*i.e.*, no treatment, sulphur alone, three stomach poisons, and the combination of sulphur and later applications of the stomach poisons—were made. Sulphur applied early in the season reduced the flea-hopper infestation, but did not affect the yield. Applications of all stomach poisons significantly decreased the boll-worm injury, boll-weevil infestation, and rapid plant bug population, and significantly increased the aphid population and yield. Natural cryolite-sulphur, 85-15, and lead arsenate-clay, 90-10, were more effective against bollworms than calcium arsenate, but less effective against the rapid plant bugs and were followed by fewer aphids. The arsenicals were more effective against weevils than the cryolite mixture. Using yields as the criterion, all stomach poisons were equally effective.

137. A Laboratory Spraying Apparatus and Technique for Investigating the Action of Contact Insecticides, with Some Notes on Suitable Test Insects. By C. Potter. (*Ann. App. Biol.*, **28**, 2, 1941, p. 142. From *Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 591.) Studies were carried out to determine a laboratory method of applying sprays containing contact insecticides in equal doses to large numbers of insects belonging to a wide variety of species. Methods described by other workers are discussed, and an account is given of the investigations leading to the development of the apparatus finally adopted, which is described. It has a reservoir and a specially designed atomizing nozzle mounted on a small circular plate carried on three bars each at an angle of 120° with the others. The end of each bar rests on the top of a metal tower, through which the spray is directed on to a spray plate or dish. This plate is carried on another, which is fitted with a universal adjustment. The whole apparatus is mounted on a wooden stand. Tests performed to determine its physical performance are described.

138. Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1939-40. By L. A. Strong. U.S. Dpt. Agr., Washington, D.C., 1940. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 425.) Ants tending root aphids on cotton were effectively controlled by sweetened baits containing thallium acetate and thallium sulphate, placed in small aluminium cans about 10 in. apart along every third row of plants, and, at less cost, by one composed of ½ lb. tartar emetic, 1 U.S. quart cane syrup, and 1 lb. sugar mixed with 1 U.S. gal. water, and absorbed by sawdust or cottonseed hulls, which was distributed in small handfuls under the plants. Sawdust was less satisfactory as a carrier than cottonseed hulls, 12 lb. of which are sufficient to absorb about 2½ U.S. gals. bait and to treat 1½-2 acres of cotton. The best results were obtained when the bait was applied on warm sunny days following cool nights, when the soil had been packed by rain and the plants were just appearing above ground. Since root aphids feed on many common cultivated and wild plants, they are abundant on cotton following crops in which weeds develop during the autumn and winter. Most of the damage by the bollworm *Heliothis armigera* to cotton in experimental plots in Texas was caused by larvæ of the second

generation. Dusts of lead arsenate and cryolites containing 97, 90, 83 and 30 per cent. sodium fluoaluminate gave almost equal control and increased the yield of seed cotton by 110-126 per cent., whereas a mixture of cryolite and sulphur containing 16·5 per cent. sodium fluoaluminate increased it only by 29 per cent. Dusts containing barium fluosilicate and calcium arsenate gave increased yields of 64 and 56 per cent. respectively. The ability of the pink bollworm (*Platyedra gossypiella*) to overwinter in New Mexico was demonstrated for the first time when larvæ in infested bolls under hibernation cages survived the winter of 1939-40. An experiment showed that delayed planting of cotton decreases initial infestation, because adults emerge before squares are available for the larvæ, but increases the population entering hibernation in autumn, since the crop matures later. Evidence was obtained that breeding almost certainly continues throughout the winter in the lower Rio Grande Valley under normal conditions and if food is available. Some larvæ entered diapause as early as July. Larvæ in diapause occurred in old bolls and locks of cotton on plants and on the soil surface or buried in the soil throughout the winter and as late as April, but no larvæ were found in loose cocoons in the soil. Although about 50 species of malvaceous plants occur in this region, only okra (*Hibiscus esculentus*) and *Malvaviscus drummondi* were infested. A rearing stock of *Microbracon kirkpatricki*, Wlkn., for use against *Platyedra gossypiella*, was imported from Egypt.

139. Entomology. By F. L. Thomas *et al.* (*Rpt. Texas Agr. Exp. Sta.*, **52**, 1938-39. p. 51. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 499.) A survey of work carried out on insect pests in Texas in 1939, particularly on the usual pests of cotton. The Pentatomid *Chlorochroa ligata*, Say, is a pest of cotton and other crops in the arid and semi-arid districts of the south-western United States, and may become a major pest of flax, particularly where mesquite (*Prosopis*) is also present. Preliminary experiments showed that it is capable of delaying the production of flax and reducing the quantity and quality of the seed. It overwinters in the adult stage, and requires about a month for development from egg to adult. The females lay 1-3 clusters of about 40 eggs each. The Tachinid, *Gymnosoma fuliginosum*, R.-D., which parasitizes 10 to 20 per cent. of the nymphs and adults in June, and an unidentified Hymenopterous parasite that destroyed approximately 30 per cent. of the eggs during May are important in controlling the bug in summer.

140. Cotton Insect Pests: Control in Argentina. By J. B. Marchionatto. (*Bol. Mensual.*, **68**, Buenos Aires, 1940, p. 594. From *J. Text. Inst.*, xxxii., **10**, 1941, A436.) Arrangements for the control of cotton pests in Argentina and recent progress in this section are discussed. Seed disinfection with carbon disulphide has been found unsatisfactory, and ginneries have been equipped with apparatus for seed disinfection by heat treatment. For the spraying of plants in the field, calcium arsenate is recommended in preference to Paris green or "fluido larvicida D.A." The use of aeroplanes for the application of such insecticides has given promising results.

141. New Œstroid Flies from Brazil. By C. H. T. Townsend. (*Rev. Ent.*, **11**, Rio de Janeiro, 1940, p. 889. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 469.) The new Tachinids described include *Paraphasiana dysderci*, gen. et sp. n., reared from adults of *Dysdercus ruficollis*, L., and *D. mendesi*, Blöte, and *Winthemia* (*Hemimasipoda*) *alabamæ*, sp. n., from *Alabama argillacea*, Hb., both in São Paulo, Brazil.

142. Insect Pests of Burma. By C. C. Ghosh. (Pubd. Supt. Govt. Prtg. and Stat., Burma, 1940. Price: Rs. 7-8. From *Ind. J. Agr. Sci.*, xi., **2**, 1941,

p. 319.) An attempt to acquaint general readers with the elementary facts about insect life, and with the common insect pests of Burma, about which little information is at present available. Simple methods, wherever possible, have been suggested for action against the pests. Technical descriptions have been reduced to the minimum, and the book appears to be meant primarily for general readers. Part I deals with general facts about insect life, classification, and the prevention and control of insect injury by chemical and biological means. Part II is concerned with general pests and those of the different agricultural crops. The book is well furnished with good illustrations, and is a useful addition to the literature on tropical insect pests.

143. Beginnings of a North China Pest Survey. By C. L. Liu. (*Peking Nat. Hist. Bull.* 15, Peking, 1941, p. 225. From *Rev. App. Ent.*, xxix., Ser. A, 9, 1941, p. 446.) An account is given of a survey of the insect pests of cultivated crops and trees started in North China in 1934 and continued until the outbreak of war with Japan. Many of the records obtained during the survey were destroyed, but the food plants, injurious stage and distribution of 115 species, and the degree of injury each causes are given in a table; of these species, about 50 per cent. are Lepidoptera and about 20 per cent. Coleoptera. Brief notes are added on some of the outstanding pests, including a few undetermined species that do not appear in the table. The chief pests of cotton are *Aphis gossypii*, Glov., and *Sylepta derogata*, F. American cotton is more susceptible to the latter than native cottons.

144. India: Report of the Imperial Entomologist. By H. S. Pruthi. (*Sci. Rpt. Agr. Res. Inst.*, New Delhi, 1939-40, p. 102.) Ecological work on the spotted bollworm of cotton (*Earias fabia*), and its important parasite *Microbracon lefroyi*, was continued. Under a saturation deficiency of 3 mm. the optimum temperature for oviposition by *E. fabia* was 25° to 30° C. A temperature of 35° C. during the entire life of the insect caused marked sterility, but was not so injurious when the influence of temperature was on the pre- or post-imaginal stage alone. The duration of the adult life was found to decrease with the increase of temperature. Although *Earias* spp. are the favourite hosts of *M. lefroyi*, it would appear that the latter have an acceptable alternative host in the pink bollworm during the off-season. A temperature of 20° C. was found to be the most suitable for the egg-laying activities of this parasite, but humidity between 0 and 3 mm. had no effect either on its longevity or fecundity. Studies on the effect of high temperature on the pink bollworm during the year showed that exposure of naked larvæ for about 24 to 30 hours to 45° C., for 1 to 1½ hours to 50° C., for 7 to 10 minutes to 55° C., for 5 minutes to 60° C., for 2 to 3 minutes to 65° C., and for 1 minute to 70° C. was fatal. To kill larvæ inside "double seeds," however, exposure of over 3 hours to 50° C., of 40 minutes to 55° C., of 15 minutes to 60° C., of 7 to 10 minutes to 65° C., and for 2 to 3 minutes to 70° C. was found necessary.

Work on the identification of parasites was continued, and among the species studied was *Eretmocerus masii*, Silv., parasitic on the nymph of *Bemisia gossypiperda*. In tests on the value of some insecticides of vegetable origin benzene extract of the seed of *Tephrosia candida* was successfully sprayed against *Bemisia gossypiperda*.

[*Cf.* Abstr. 175, Vol. XVII. of this Review.]

145. Capsid Pests of Cacao in Nigeria. By F. D. Golding. (*Bull. Ent. Res.*, 32, 1, 1941, p. 83. From *Rev. App. Ent.*, xxix., Ser. A, 10, 1941, p. 515.) The Capsid pests of cacao in West Africa are discussed from the literature, and notes are given on the occurrence in recent years in two districts in Southern Nigeria of *Sahlbergella singularis*, Hagl., *S. theobroma*, Dist., and a species of *Helopeltis*,

here recorded as *H. bergrothi*, Reut., which was first found attacking the shoots and pods of cacao in Southern Nigeria in 1939. The identity of the species of *Helopeltis* that occur in West Africa is discussed. Orange and red Capsids collected on cotton in Southern Nigeria in 1925 were identified as *H. bergrothi* and *H. sanguineus*, Popp., respectively, but H. Hargreaves, who received examples of both Capsids from the author in 1934 and apparently bred out series of adults, considered them both to be forms of *H. bergrothi*. During the last twelve years *Helopeltis* has become one of the most important pests of cotton in Southern Nigeria, and orange males and red females have been observed pairing in the field. G. S. Cotterell recorded *H. bergrothi* on cotton in British Togoland in 1928, but in 1935 he informed the author that the species had recently been identified as *H. labaumei*, Popp. J. V. Leroy recorded *H. bergrothi* from cotton in the Belgian Congo and gave coloured illustrations of the adults, nymphs and eggs. Coloured illustrations of the same stages of *H. bergrothi* on cacao in the Gold Coast, where it is a well-known pest of this plant, were given by Cotterell in a paper, and from a comparison of these two series of illustrations the author considers that they represent distinct species. The species found on cacao by the author in 1937 differed from the one attacking cotton there, and the nymphs resembled, although the adults differed from, those on cacao in the Gold Coast illustrated by Cotterell. It was subsequently identified as *H. bergrothi*, but in the author's opinion it is distinct from the species on cotton in Nigeria and the Belgian Congo, which he believes to be identical.

146. Nyasaland: Report of the Entomologist, 1940. By C. Smee. (*Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 588.) In 1940 small numbers of *Platyedra gossypiella*, Saund., were found on cotton throughout the Shire River valley in the Nyasaland Protectorate, and attention is again drawn to the necessity for a dead season between crops to control this pest. No diapausing larvæ have been found between double seeds, but a few were observed to diapause for three to four months in sealed cocoons formed in the lint among seed cotton. The Braconid parasite, *Microbracon kirkpatricki*, Wlkn., appears to be fairly well established in the Lower Shire district. *Apanteles diparopsidis*, Lyle, was observed parasitizing small larvæ of *Diparopsis castanea*, Hmps., on late bolls towards the middle and end of the season, but gave insignificant control. *Mesochorus ornatus*, Wlkn., was reared from a species of *Rhogas* parasitizing larvæ of *Earias* on cotton.

147. Pests of Cotton in Peru, 1939. By J. E. Wille. (*Mem. de la Estac. Exp. Agr. de La Molina*, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 509.) *Mescinia peruella*, Schaus, caused considerable injury in autumn to the bolls of late cotton. Infestation was most serious in districts having a damp climate, and least so at high altitudes. *Heliothis virescens*, F., continued to spread on cotton. The eggs are laid principally on the young leaves of the terminal shoots, and the larvæ migrate to the buds and bolls, feeding very little on the leaves, except on young plants on which buds have not yet been formed. Pupation occurs in the soil. Some of the autumn pupæ hibernate, but others give rise to adults during the winter. The chief food plant at this season is chick pea (*Cicer arietinum*), but the larvæ also occur on cotton when it is present. Trap crops of chick pea afford the best means of control; other measures are cultivation of the soil to destroy the pupæ and the use of a dust of equal parts of calcium arsenate and sulphur on young cotton. It is emphasized, however, that the best prospect of control lies in the abandonment of ratoon cultivation and the establishment of a close season, possibly in June and July, accompanied by rigorous field sanitation. Infestation of cotton by *Dysdercus ruficollis*, L., was light at the beginning of the year, following very sunny weather at the end

of 1938. Migration to wild food plants began in July, and development was favoured by the mild winter. Parasitism by the Tachinids, *Acaulona peruviana* Tns., and *Paraphorantha peruviana*, Tns., was high in September. The stainers returned in numbers to cotton in October, but the infestation gradually diminished in November except in one valley, in which it continued until the end of the year. This diminution was due to sunny weather and parasitism by the Tachinids, which reached 50 per cent. Infestation by *Anthonomus vestitus*, Boh., was not serious, and in July 90 per cent. of the larvæ were parasitized by the Braconid, *Triaspis vestiticida*, Vier. Damage was caused to cotton in various localities by *Anomis luridula*, Gn. (*texana*, Riley); parasitism of the larvæ by *Eucelatoria australis*, Tns., was high locally and exceeded 60 per cent. in March in one valley. The failure of dusts of calcium arsenate to give control was attributed to the lateness of the treatments and to insufficient rates of application for the heavy populations present. Infestation of the new crop occurred at the end of the year, but 80 per cent. of the larvæ were parasitized by *E. australis* in one valley. In laboratory experiments by F. F. Bibby, two dusts of cryolite and sulphur (1 : 4 and 1 : 1) gave 90 per cent. mortality of the larvæ in 5 and 9 days respectively, whereas the calcium arsenate dust usually employed against them killed 95 per cent. in 24 hours and 100 per cent. in 48. Observations on parasitism showed that *E. australis*, which also attacked *Alabama argillacea*, Hb., was most active in the valleys of central Peru. Further north, the commonest parasite of *Anomis* was a species of *Rhogas*, while in some districts up to 15 per cent. of the larvæ were parasitized by a Braconid probably belonging to the genus *Microbracon*.

A brief account is given of investigations showing that a leaf-curl of cotton first observed in the Huaura Valley in 1938 was most probably caused by the feeding of an undescribed jassid of the genus *Empoasca* that had not previously been observed to cause economic injury. In experiments on control, a sulphur dust killed or repelled over 70 per cent. of the jassids and gave better control than several other dusts and sprays. A form of leaf-curl in the Piura Valley was caused by another jassid, *Oncometopia minor*, Osb., and one that appeared in October in the Canete Valley was associated with the Coccinellid, *Psyllobora luctuosa*, Muls., which apparently attacked the leaves in the absence of aphids, on which it is predaceous. Other pests of cotton included *Leucothrips theobromæ*, Priesn., *Aphis gossypii*, Glov., *Eriophyes gossypii*, Banks, *Pseudococcus* sp., which injured the bolls in damp fields, and *Lasioderma serricorne*, F., which was favoured by high temperature, and attacked seed cotton just before it was harvested.

148. Cotton Pests in the Philippines. By F. Q. Otanes and F. L. Butac. (*Philipp. J. Agr.*, **10**, 4, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **12**, 1941, p. 648.) A revision of a previous paper. Spraying with soap solution is recommended against sucking insects and mites (*Tetranychus* sp.). When applied against *Aphis gossypii*, Glov., *Ferrisiana* (*Ferrisia*) *virgata*, Ckll., and *Empoasca flavescens*, F., the spray should be directed to the lower surfaces of the leaves to ensure thorough wetting of the insects. Control measures against *Pempherulus* (*Pempheres*) *affinis*, Faust, include hand-picking of adults in the early morning, prompt removal and burning of infested stems and, if the attack is severe, the burning of the whole plant. Hand-picking of larvæ and spraying with soap solution or calcium arsenate are suggested for the control of *Sylepta derogata*, F. The species of *Homona* and *Bemisia* previously recorded have been identified as *H. phanæa*, Meyr., and *B. inconspicud*, Quaint, and one of the species of thrips as *Bussothrips claratibia*, Moult. Insects observed in small numbers on cotton and considered of minor importance are *Dysdercus pœcilus*, H.-S., *Tectocoris diophthalmus*, Thnd. (*lineola*, F.) *Saissetia coffeæ*, Wlk.,

(*hemisphærica*, Targ.), *Nezara viridula*, L., *Drosicha townsendi*, Ckll., *Ricania speculum*, Wlk., *Dictyophora* sp., *Phaneroptera furcifera*, Stal; and *Prodenia litura*, F.

[*Cf.* Abstrs. **282**, **472**, and **642**, Vol. XIII. of this Review.]

149. Russia: Results of the Work of the Laboratory of Biological Control at the Institute for Plant Protection. By N. F. Meier. (*Summ. of Sci. Res. Work of the Inst. of Pl. Prot.*, Leningrad, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 581.) Work by Livshitz on the aphids that infest cotton in the district of Anapa on the Black Sea showed that an infestation is not evenly distributed throughout the field. A decrease in the abundance of the aphids in summer was due not to the dry hot weather, but to the activity of parasites, of which *Aphidius cardui*, Marsh., was the most important, and predaceous Coccinellids, of which *Coccinella septempunctata*, L., and *Adonia variegata*, Gze., were the commonest. *Propylæa quatuordecimpunctata*, L., was less frequent.

150. Thailand: Cotton Pests. By L. Jotisalikara. (*Ann. Rpt. Cott. Exp. Sta. Klonglan, Swankaloke, Thailand*, 1937-38. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 6.) Cotton pests were more prevalent during 1937-38 than in the previous season. A weevil of the genus *Amorphoidea* infested the flowers and apparently caused extensive shedding of the young bolls, and *Platyedra gossypiella*, Saund., destroyed a large proportion of the bolls of all stages. *Sylepta derogata*, F., and *Pempherulus* (*Pempheres*) *affinis*, Faust., occurred in small numbers, the latter attacking cotton that was planted early. The maximum, minimum, and average periods required for the development of the various stages of *P. gossypiella* and *S. derogata* and the number of eggs laid by females of the latter are shown in tables. American varieties were in general freer from insect attack than Cambodia varieties, but jassids were troublesome on them.

151. Cotton Root Aphids: Control. By C. F. Rainwater. (*U.S. Dpt. Agr., Bur. Ent. Pl. Quarantine*, E. 533, March, 1941. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 515.) Cotton roots are attacked by white, green, and brown aphids, and the best means of checking them is to place a poison bait containing tartar emetic at intervals of about 10 feet in the rows just as the cotton is beginning to sprout. Particulars are given.

152. Le Charançon du Cotonnier en Haiti. By A. Audant. (*Bull. Serv. Nat. Prod., Agr. Enseign. Rur. Haiti*, **16**, 1938, p. 64. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) A series of plot experiments were carried out to determine whether certain indigenous perennial cottons of Haiti were resistant to *Anthonomus grandis*, Boh., as had been claimed for them. Annual cottons were used as controls. Though no definite conclusion is drawn about the point at issue, it appears that the indigenous cotton has the following advantages over the annual type: it is much more resistant to the pink bollworm and mosaic, and is more hardy, thriving where more delicate forms would not grow. It is suggested that the indigenous cottons could be improved by selection for earliness, and some promising types for such improvement have already been found.

[*Cf.* Abstr. **117**, Vol. XV. of this Review.]

153. Investigations on the Control of Cotton Insects. By F. F. Bondy and C. F. Rainwater. (*53rd Rpt. S. Car.*, 1939-40. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 43.) The development since 1923 of work on the control of *Anthonomus grandis*, Boh., on cotton in South Carolina is briefly reviewed. Experiments during 1928-40 showed that the most effective and profitable single treatment is dusting with calcium arsenate at five-day intervals, beginning when 10 per cent. of the squares become infested. The chief objections to this treatment

are that it is expensive and requires special dusting apparatus, that it is often followed by infestation by leaf aphids (*Aphis gossypii*, Glov.), and that it may cause injury to subsequent crops. In South Carolina, however, no case of soil injury has been observed by the authors during several years of investigations. Tests in South Carolina and Mississippi to determine the amounts of calcium arsenate that would cause injury on different types of soil have shown that 200 lb. per acre on light sandy soils results in some injury to cowpeas, but that cotton is not damaged until 400 lb. is applied. On heavier soils, 1,600 lb. per acre caused no damage to cotton. Ordinarily, not more than 40 lb. calcium arsenate per acre would be needed per year for weevil control, and it is considered that the risk of consequent soil injury has been greatly exaggerated.

In an attempt to prevent leaf aphids from increasing to injurious numbers, experiments were carried out on the use of mixtures of calcium arsenate with equal parts of hydrated lime or sulphur. The mixture with lime, applied at the rate of 6-8 lb. per acre, did not cause so large an increase of aphids and gave satisfactory control of the weevil, but in some years there was still some aphid injury following its use. In 1939, 0·5 per cent. nicotine was added to this mixture, and enough derris or cubé to give a rotenone content of 0·5 per cent. was added to mixtures of calcium arsenate and equal parts of sulphur or diatomaceous earth. All these combinations were effective in preventing aphid injury, but rotenone was superior to nicotine. These results were confirmed in 1940, when plots that received undiluted calcium arsenate with 0·5 per cent. rotenone were only slightly more infested by aphids than the controls, and plots receiving calcium arsenate alone were heavily infested. Those treated with mixtures of calcium arsenate and sulphur or diatomaceous earth with rotenone were less heavily infested than the controls.

[*Cf.* Abstr. **142**, Vol. XVIII. of this Review.]

154. Further Studies of Various Insecticides against Three Cotton Insects. By G. L. Smith *et al.* (*J. Econ. Ent.*, **34**, 2, 1941, p. 310. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 504.) Cage tests conducted at Tallulah, La., in 1939, in which several arsenicals and cryolites were used against the boll weevil and the cotton leafworm, and derris, pyrethrum, sulphur, and calcium arsenate-sulphur mixtures against the tarnished plant bug, are reported. "With calcium arsenates that had been separated into fractions according to particle size, definite correlations were shown between particle size and percentage of water-soluble arsenic pentoxide as determined by the New York method, between particle size and net boll weevil mortality, and between percentage of water-soluble arsenic pentoxide and net mortality. Calcium arsenate was more effective against the boll weevil and the cotton leafworm than cryolite, with or without wetting agents. Dicalcium arsenate gave better results than commercial calcium arsenates, calcium arsenate-sulphur mixtures, or basic copper arsenate. The addition of wetting agents to calcium arsenate and to cryolite did not significantly affect mortality. Calcium carbonate and sulphur appeared to be better carriers for calcium arsenate than lime. Against adults of the tarnished plant bug, calcium arsenate-sulphur mixtures caused a higher mortality than sulphur alone. There was no significant difference in effectiveness between derris and pyrethrum, but both were more effective than calcium arsenate-sulphur mixtures."

[*Cf.* Abstrs. **324**, Vol. XV.; **681**, Vol. XVI.; and **133**, Vol. XVIII of this Review.]

155. Insecticide Tests on the Bollworm, Boll Weevil, and Cotton Leafworm in 1940. By R. W. Moreland *et al.* (*J. Econ. Ent.*, **34**, 4, 1941, p. 508. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 67.) Cage toxicity tests carried

out in Texas indicated that when bollworm larvæ were arranged into four weight groups it was found that in general mortalities due to insecticides varied inversely with the weight of the larvæ. A mixture of basic copper arsenate and lime killed a slightly higher percentage of large worms (over 45 mg.) than calcium arsenate killed of small worms (under 15 mg.). Against bollworm larvæ of all weight groups the average mortality after 120 hours was 91·8 per cent. from the basic copper arsenate and lime mixture, 87·9 per cent. from lead arsenate, 83·7 per cent. from undiluted basic copper arsenate, 82·7 per cent. from cryolite containing 66·1 per cent. sodium fluoaluminate, and 62·3 per cent. from calcium arsenate. Basic copper arsenate was more effective against bollweevil and leafworm than calcium arsenate.

156. Cryolite and Cryolite-Sulphur Mixtures for Boll Weevil Control and their Effect on the Cotton Aphid. By F. L. McGarr. (*J. Econ. Ent.*, **34**, 4, 1941, p. 500. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 67.) The results of tests conducted at State College, Mississippi, indicated that cryolite-sulphur mixtures containing sodium fluoaluminate gave little or no control of boll weevil, and cryolite alone was only half as effective as calcium arsenate. With the cryolite-sulphur mixtures the aphid population increased in proportion to the sodium fluoaluminate.

[*Cf.* Abstr. **145**, Vol. XVIII. of this Review.]

157. Cotton Bollworm: Natural Control of Eggs and First Instar Larvæ. By R. K. Fletcher. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 55.) Observations made on 378 eggs laid on cotton plants indicated that 40 per cent. of these eggs hatched, 17 per cent. were destroyed by the predaceous sucking insect *Orius insidiosus*, 15 per cent. by the egg parasite *Trichogramma minutum*, 19 per cent. were knocked from plants by cultivation or wind, and 8 per cent. were unaccounted for. Two hundred and seven first instar larvæ were studied on the cotton plants: 68 per cent. were killed by *O. insidiosus*, 7 per cent. by spiders, 25 per cent. bored into small squares or bolls or were inside the bracts at last observation, 28 per cent. dropped or were blown from plants, and 7 per cent. were unaccounted for.

158. Insecticide Tests for Bollworm Control during 1940. By J. C. Gaines. (*J. Econ. Ent.*, **34**, 4, 1941, p. 515. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) Two experiments for bollworm control conducted at College Station, Texas, are reported. Comparison was made of the effectiveness of synthetic and natural cryolite, lead arsenate, commercial calcium arsenate, and a special calcium arsenate containing a high percentage of water-soluble arsenic pentoxide. Records of the infestations of weevils, rapid plant bugs, and aphids that developed on the plats made it possible to obtain some information on the action of the insecticides on these pests also. Lead arsenate and natural cryolite-sulphur (85-15) gave better control of the bollworm than the calcium arsenates or synthetic cryolite-sulphur (85-15). All arsenicals were more effective against the weevils than the cryolite. The arsenicals containing the highest percentage of water-soluble arsenic pentoxide caused the largest increases in aphids, but gave the best control of the rapid plant bugs. In general the plats treated with arsenicals yielded more cotton than the plats treated with cryolites, because the cryolites did not give adequate control of the boll weevil.

[*Cf.* Abstrs. **154** and **393**, Vol. XVIII. of this Review.]

159. Descripción de Una Especie Nueva del Género *Conotrachelus*, Sch. (Col. Curculionidæ). By A. Hustache. (*Notas Mus. La Plata*, **4**, Zool. No. 23, Buenos Aires, 1939. With French summary. From *Rev. App. Ent.*, **xxix.**, Ser. A, **9**, 1941, p. 445.) Descriptions are given of the adults of both

sexes of *Conotrachelus denieri*, sp.n., taken in eastern Formosa, Argentina, in July, 1939. In supplementary notes, P. C. L. Denier states that the weevils were taken on wild plants close to cultivated cotton. He has received examples from cotton in Concepcion, Paraguay, where the larvæ sometimes destroy the entire crop. The females oviposit in the green fruits; the larvæ feed in the bolls and have been observed to pupate in them, though it is considered that they normally do so in the soil. Bolls formed as early as October are attacked, and infested ones turn brown and fall.

160. Cotton Flea Hopper: Host Relation. By E. Hinson. (*Iowa State Coll. J. Sci.*, **16**, 1941, p. 66. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 56.) The cotton flea hopper, *Psallus seriatus*, Reut., occurs in 22 of the United States. The cotton plant is injured by the feeding of the adults and nymphs which pierce the tissue of the growing tip and suck the sap, causing death and shedding of the small squares. The plant responds to the injury either by making a whip-like growth with scarcely any branches, or a rank vegetative growth, in both cases being devoid of squares and blooms. The flea hopper feeds on 138 species of plants which are distributed in 28 families, the most important of which are *Œnothera*, *Monarda*, *Solanum* and *Croton*. The distribution of the host plants, their seasonal classification, and observations of the feeding of nymphs and adults on them are discussed. The population of flea hoppers in cotton is never as large as in the weed hosts. Probably the easiest method of control would be to mow all infested areas and encourage grasses to grow.

161. Fruiting of Cotton in Relation to Cotton Flea Hopper and Other Insects which do Similar Damage to Squares. By A. L. Hamner. (*Miss. Sta. Bull.* 360, 1941. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 68.) The complete loss of young squares through the third week in July failed to cause significant losses in the yield of seed cotton where the fruit was protected from boll weevil and other insects and disease was negligible. Plats which had the squares removed for more than two weeks produced cotton with a staple length about 1/32 inch shorter than check plats. Sulphur dust at the rate of 10 lb. per acre is effective against the flea hopper, and two applications should be sufficient for the purpose.

162. Contribucion al Conocimiento de Algunos Enemigos Naturales de la Oruga de la Hoja del Algodonero (*Alabama argillacea*, Hübn.) By G. A. Kreibohm de la Vega. (*Rev. Indus. y Agr.*, **30**, 7-9, pp. 163-171, Tucuman, Argentina, 1940. From *Cott. Lit.*, March, 1941, p. 224.) A contribution to the knowledge of some natural enemies of the cotton leafworm (*Alabama argillacea*).

163. The Bionomics of *Empoasca devastans*, Distant, on some Varieties of Cotton in the Punjab. By M. A. Husain and K. B. Lal. (*Ind. J. Ent.*, **2**, 2, 1940, p. 123. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 516.) An account of the observations on the bionomics of *Empoasca devastans*, Dist., carried out at Lyallpur in 1935-37 in view of the increasing damage it has caused to cotton in the Punjab during the last 25 years. All stages of this jassid are described, and a list is given of 17 species of *Empoasca* that have been recorded on cotton in various parts of the world. Other plants on which *E. devastans* was observed breeding at Lyallpur were hollyhock, castor, egg-plant, potato, *Hibiscus esculentus*, and *H. vitifolius*, the last two being much favoured. Eggs are laid in the leaf veins and hatch in 4-11 days. The maximum number of eggs deposited by one female was 29, but females in captivity usually laid only about 15. The duration of the nymphal stage ranges from 7 days in autumn to 21 days in winter, and the nymphs feed on the leaves, at first near the bases of the veins and later over the whole of the lower surfaces. Unmated adults

survived for more than 3 months, but mated examples did not live longer than 5 weeks in summer and 7 in winter. Breeding occurs throughout the year at Lyallpur, except possibly from late January to late March. In early spring eggs are deposited on hollyhock, egg-plant and potato, and infestation spreads from these to ratoon cotton and *H. esculentus*. Cotton seedlings are attacked at the end of June, and from then onwards *H. esculentus* and American cotton are heavily infested. About the beginning of November the population declines on cotton and *H. esculentus*, and a little later on *H. vitifolius*, but increases on potato, hollyhock, and egg-plant, which are the chief winter food plants. Eleven generations, lasting 15-46 days, were observed in a year, but there is considerable overlapping.

Cotton is usually most susceptible to attack in the preflowering stage, which occurs in the Punjab when it is 8-10 weeks old. Both nymphs and adults injure the plants chiefly by injecting toxic saliva into the tissues; there is no evidence that they transmit any virus to the plants. On varieties that are resistant to attack the first symptoms are a wilting of the leaf, followed by the drying up of the apex and periphery, which become brown and necrotic. On susceptible varieties there is a general mottling and curling of the leaf, and later in both the leaf assumes a brick-red colour with strips of yellowish-green along the principal veins. In the Punjab the native cottons are more or less resistant, while American cottons are in general susceptible, though there is considerable local variation. Investigations on the factors conferring resistance showed that nymphs of all instars are able to feed and develop on both susceptible and resistant, hairy and non-hairy varieties of cotton, that there is no reduction in fertility in adults from nymphs reared on resistant plants, but that there is marked reduction in oviposition (or possibly hatching) on resistant varieties. Further investigations showed that, other conditions being equal, early sown cotton is less liable to attack; that maximum infestation occurs immediately preceding bud formation; that various manurial and irrigation treatments did not affect the incidence of the jassid; that there was no apparent correlation between the *p*H of the leaf sap and susceptibility to attack; and that while nearly all resistant varieties of cotton are hairy, not all hairy varieties are resistant.

In investigations in the Punjab on control, catching the adults with hand nets was found impracticable on a large scale, and light-traps were ineffective. Dusting with a mixture of calcium cyanide and wood ash (1 : 8) gave over 90 per cent. mortality, but was expensive, while spraying with resin soap and with resin compound (resin and sodium carbonate) was successful on a small scale; sprays containing nicotine have given good results against adults and nymphs in Madras. No parasites have been recorded from *E. devastans*, and little control is afforded by predators (ants and spiders). The development of resistant varieties of cotton offers the greatest promise of control.

164. Primeiros Resultados das Experiencias de Combate à Broca do Algodoeiro *Gasterocercodes brasiliensis*, Hambl. (Col. Curcul.), por Meio de Pulverizações com Caldas Arsenicais. By H. F. G. Sauer. (*Arq. Inst. Biol.* 11, p. 499, São Paulo, Brazil, 1940. Summary in English. From *Rev. App. Ent.*, xxix., Ser. A, **12**, 1941, p. 623.) An account is given of investigations in São Paulo, Brazil, on the life-history and control of *Gasterocercodes brasiliensis*, Hambl., which is an important pest of cotton and is not satisfactorily controlled by the methods hitherto recommended. Observations have shown that at the time of picking almost all the cotton plants are infested by this weevil. Large numbers of the adults survive the winter in spite of cultural measures, and are attracted in spring to the new cotton fields. Those planted early are attacked

first, and as their area is comparatively small the infestation is heavy and the young plants are severely injured or even destroyed. One early-planted field had an infestation of 95 per cent. 3 months after planting, and about 50 per cent. of the plants were killed. The spread of infestation is difficult to explain on the assumption that the adults migrate by crawling. They are active only at night, which renders observation difficult, but the author has shown that they are able to fly. At first the overwintered adults feed on any part of the young plant, but in older ones the region of the root collar is preferred for feeding and oviposition. Oviposition begins when the plants are about 3-4 inches high. During the preoviposition period of about 5 days the adults feed on the leaves and bark, with a marked preference for the lower part of the stem. From October to March, when temperature and humidity are highest, development from egg to adult emergence from the stalks takes about 72 days, the first generation requiring less than the second.

In view of work by Pyenson, experiments were carried out on the value of arsenical sprays against the adults, and the results are given in detail in a series of tables. The insecticides tested in the laboratory were arsenates of calcium, lead, and aluminium, containing 40·18, 32·2, and 27·6 per cent. As_2O_5 respectively. They all reduced the amount of feeding on sprayed plants and gave considerable mortality. They were effective in the order given, but aluminium arsenate was much inferior to the others. The females appeared to feed more than the males, but mortality was about equal. A spray of 0·5 per cent. calcium arsenate gave very good results, and these were not improved by increasing the concentration; it was therefore adopted in preliminary field tests on artificially infested plants. The percentage mortalities 5 and 10 days after treatment were 91·7 and 98 respectively, and very similar results were obtained in a second test. In further experiments, in which field plots arranged in a Latin square were artificially infested with weevils, sprays of 0·3 per cent. calcium arsenate, 0·3 per cent. lead arsenate, and 0·25 per cent. Paris green were applied eight times at weekly intervals, beginning on December 2. The results are recorded in tables, giving the proportions of plants infested on various dates and the numbers of all stages of the weevil found on them, and are analyzed statistically. They showed that calcium arsenate and lead arsenate were significantly superior to the controls, and calcium arsenate to Paris green, but the differences between the two arsenates were not significant. Paris green was barely superior to the controls. The differences in effectiveness were to some extent obscured by faulty application in the early part of the experiment and by migration of weevils from the controls to the sprayed plots. In an area of about 21,000 sq. yds., sprayed four times at intervals of 25-30 days with 0·6 per cent. calcium arsenate, starting when the plants were 5-6 inches high, the infestation was 32 per cent. after four months, as compared with about 74 per cent. in a neighbouring unsprayed field. After this date the infestation increased, and at harvest was about equal in the two areas. The population in the sprayed field, however, consisted chiefly of young individuals, and there was little deformation of the stalks. The growth of the plants was far better, and there seemed to be less shedding in the treated area. The correct dates for spraying have not been determined, but the applications should begin when the plants are only a few inches high; the first spray should cover the entire plant, but the others only the lower part.

165. Cotton Jassids and their Control. By K. B. Lal. (*Ind. Frmg.*, September, 1941, p. 465.) An account of the life-history and habits of cotton jassids and the nature and extent of the injury caused by them. Cotton jassids are especially serious in East, West, and South Africa, and in the Punjab, Sind,

and Madras. Control measures suggested are spraying the cotton plants with rosin compound, pyrethrum, or other contact insecticides, or by dusting with nicotine or calcium cyanide. Destruction of alternative host plants is not recommended, since certain of these plants are of good economic value. In North-West India several species of spider prey on the nymphs and adults of cotton jassids, but are not effective in controlling the pest. No insect parasite of cotton jassids appears to be known. For future work on the problem the author suggests the following: A study of the physical and chemical characteristics of the leaf veins in the resistant and susceptible cotton varieties to determine what it is that makes some veins unsuitable for egg-laying by jassids. In addition, the effect of such environmental factors as temperature, rainfall, presence or absence of host plants other than cotton, which undoubtedly influence jassid multiplication, should be studied. The seasonal population of jassids on cotton and other host plants, and the causes of their fluctuation, not only from season to season but from year to year, should also be investigated.

166. GEORGIA: COTTON PESTS, 1941. (*Ann. Rpt. Ga. Exp. Sta.*, 1940-41, p. 118.) In May, 1941, there was an outbreak of the pale-striped flea beetle, *Systena blanda*, Mels., in the Piedmont region. The principal crop attacked was cotton, but some damage was also suffered by peppers and beans. Most of the feeding was on the cotyledonary leaves, the beetle chewing off small patches on both surfaces. Quite a number of plants were killed by the beetles, but usually not enough to affect the stand. Outbreaks in Georgia have always been associated with long periods of dry weather in winter and spring.

167. BIOLOGY OF THE COTTON STEM WEEVIL, *Pempherulus affinis*, FST., UNDER CONTROLLED PHYSICAL CONDITIONS. By P. N. Krishna Ayyar and V. Margabandhu. (*Bull. Ent. Res.*, **32**, 1, 1941. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 515.) The following is based on the authors' discussion and summary of the results of laboratory studies on the physical conditions affecting the adult longevity, oviposition and immature stages of *Pempherulus affinis*, Faust, on cotton that were begun in India in 1937. A technique for evaluating the effects of temperature and relative humidity was developed and is described. The upper vital temperature limit for adults is about 100° F., and the upper thermal death point about 122° F., an exposure of 6 hours being needed for mortality at that temperature and one of 48 hours at 113° F. Above 100° F. variations in humidity have no effect on longevity. Adult longevity increased from 6 hours to 98 days as the temperature was lowered from 122° to 91° F., and reached its maximum, with oviposition, at 91° F. and a relative humidity of 73 per cent. At normal temperatures (about 93° F.), a high degree of humidity (60-80 per cent.) is necessary for maximum adult longevity. Within vital limits, the optimum humidity varies directly with the temperature, lying between 60 and 80 per cent. at 90° F. and between 80 and 100 per cent. at 100° F. The upper temperature limit for oviposition is about 113° F., but those for hatching and embryonic development are somewhat below and near 100° F. respectively. Oviposition occurred at a wide range of humidities; the optimum for it varied between 80 and 100 per cent. at 100° F., and between 60 and 80 per cent. at 93° F.; at 91° F. it was about 73 per cent. The incubation period was only slightly affected by variations in humidity at normal temperatures; the optimum for hatching and survival of the larvæ was 100 per cent., although hatching, which at 60 per cent. was only partial, was complete at 80 per cent. The greatest mortality occurs in the egg and early larval stages, which are very sensitive to desiccation. Some prepupæ and pupæ can develop in humidities as low as 0-40 per cent., but one of 100 per cent. is unfavourable, owing to fungous growth. The rate of development of mature larvæ, prepupæ, and pupæ varied inversely

with the humidity; at 93° F. and 100 per cent. the life-cycle occupied 66 days, whereas, when the mature larvæ were transferred from 100 to 60 per cent., it occupied only 52. The occurrence of *P. affinis* only in irrigated crops can be attributed to its high requirement of moisture and not to varietal preferences, and its distribution is confined to districts where moist, humid conditions prevail.

168. Factors influencing the Formation of Resting Pink Bollworm Larvæ. By A. J. Chapman and M. H. Hughs. (*J. Econ. Ent.*, **34**, 4, 1941, p. 493. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 74.) Experiments with larvæ overwintering in bolls as well as in cocoons in the soil or on the surface of the soil were conducted at Presidio, Texas, to determine some of the factors conducive to the development of resting larvæ. The findings emphasize the importance of early maturity of the cotton crop, combined with early field clean-up in areas where practicable, in reducing the number of pink bollworm entering the resting stage.

169. Control of Pink Bollworm with Insecticides. By A. J. Chapman and W. L. Lowry. (*J. Econ. Ent.*, **34**, 4, 1941, p. 490. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 74.) Tests carried out at Presidio, Texas, indicate that fluorine compounds, particularly cryolite, give the best control when applied as sprays or dusts.

170. La "Lagarta Rosada" del Algodonero (*Pectinophora gossypiella*, Saunders). By K. J. Hayward. (*Circ. Estac. Exp. Agr., Tucuman*, No. 93, 1940. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 498.) A brief account is given of the bionomics, distribution and control of *Platyedra* (*Pectinophora*) *gossypiella*, Saund. This Tineid already occurs in Argentina, but has not yet spread to the Province of Tucuman, where much cotton is grown. Unceasing vigilance will be needed to prevent its entry.

171. Apuntes Sobre Insectos que Pueden ser de Interes para la Agricultura Argentina. By J. M. Bosq. (*Rev. Chil. Hist. Nat.*, **43**, Santiago, 1940, p. 49. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 512.) These notes include a record of an example of *Prionobrachium fuscum*, Hust., on cotton in Tucuman; this weevil usually develops in the fruits of *Abutilon*.

172. Studies on *Pyrausta nubilalis*, Hübner, attacking the Cotton Plant. By M. Koo. (In Japanese.) (Kofu, Yamanashi Agr. Exp. Sta., 1940. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 15.) In Yamanashi Prefecture, Honshu, cotton is attacked by *Pyrausta nubilalis*, Hb., which has three overlapping generations a year, the adults emerging from late May to early October. The overwintered larvæ pupate from mid-May to late June, mostly in late May. The females are somewhat more numerous than the males, and represented 65·7 per cent. of the adults taken in a light-trap. Females lived for up to 17·6 days and males for up to 8. Oviposition began 2-4 days after emergence and continued for 2-10 days, most eggs being laid on the first day. The average and maximum numbers of eggs laid per female were 134·7 and 564, a single mass containing 26-32 eggs; 88·9 per cent. of the eggs were found on the lower surfaces of cotton leaves. Oviposition occurs on cotton from late June to early October, mostly from late August onwards. Injury to cotton is conspicuous from late July to mid-October and is serious in September. The larvæ hatched in 3-5 days and bored into the plants about 6 days later; the larval stage averaged 31·4 days in spring and 19·3 days in summer, and the pupal stage lasted 6-19 days. The larvæ entered hibernation from early September to late October, but only 10 per cent. of the overwintering population reached the adult stage, owing to heavy mortality from early March onwards. About 88 per cent. of the hibernating larvæ were found among fallen leaves and in cotton stalks. This

Pyralid attacks several other plants in Yamanashi Prefecture, where hemp and *Sorghum* received more eggs and suffered greater injury than maize. Over 96 per cent. of the eggs are sometimes parasitized by *Trichogramma* spp. The Tachinid, *Ceromasia senilis*, Mg., parasitizes the larvæ, while the predaceous Anthocorid, *Orius* (*Triphleps*) *sauteri*, Popp., destroys the eggs and the young larvæ before they enter the plants, and the Carabid, *Chlaenius pictus*, Chaud., also feeds on the larvæ. Sprays of Bordeaux mixture or a proprietary derris preparation did not prevent oviposition, and although dusting with tobacco decreased it and the subsequent injury, it increased the dropping of the buds and bolls. Spraying with lead arsenate decreased injury, and calcium arsenate also gave promising results.

173. Rapid Plant Bug: Control. By J. C. Gaines. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 57.) Populations of the rapid plant bug (*Adelphocoris rapidus*, Say) develop late in the season and have been found capable of causing some injury to cotton. Experiments indicated that calcium arsenate with a high percentage of water-soluble arsenic pentoxide gave control of the pest, while a mixture of sulphur and commercial calcium arsenate (2-1) gave a 39 per cent. control.

174. Entomological Progress—II. By C. O. Eddy. (*Bull. Agr. Exp. Sta., La.*, No. 323, Baton Rouge, La., 1940. From *Rev. App. Ent.*, xxix., Ser. A, **12**, 1941, p. 599.) It is stated that considerable injury is caused by the sand wireworm, *Horistonotus uhleri*, Horn, to cotton, maize, cowpeas, most vegetable crops, and some grasses from time to time in Louisiana. The eggs are laid in June and July, and the larvæ, which hatch in about 12 days, feed on the roots and underground parts of the plant and give rise to adults in the following May-July. The greatest damage is caused by the larvæ approaching maturity in May and June. Observations in Louisiana have shown that soy beans, planted early, are the most practical crop to use in the one-year rotation programme required to control or eliminate this Elaterid from soil in which its preferred food plants have been growing. Leaving infested land fallow for one year is almost as effective, but has not the same agricultural advantages. The velvet bean (*Stizolobium*) and kudzu (*Pueraria hirsuta*) are also favourable crops for rotation, but are less desirable. An effective rotation in preliminary tests was to follow infested cotton or maize with winter oats planted in autumn, and then with summer sagrain (a grain-producing sorghum with a sweet stalk) planted not earlier than July 10. In some instances the addition of large amounts of organic matter as manure gave adequate control.

175. On the Biology of *Dysdercus howardi*, Ballou. II. The Effect of Continued Inbreeding on the Life-History. By E. I. MacGill. (Reprinted from *Bull. Ent. Res.*, **23**, 3, 1941.) A number of generations of *Dysdercus howardi*, Ballou, bred in the laboratory between 1932 and 1934 are compared with a similar number of generations bred from 1940 to 1941. There is found to be no significant difference in the length of the life-cycle in the two periods. There is a significantly greater number of adult female insects in the earlier generations of *D. howardi* (eleven generations). In the later generations there is a high percentage of infertile eggs. The difference between the two groups of insects is highly significant. There is no significant difference in the percentages of nymphs becoming adult in the two periods. The differences in the numbers of adult insects and in the sex ratios obtained in 1932-34 and 1940-41 are found to be non-significant (twelve generations).

[*Cf.* Abstr. **126**, Vol. XIII. of this Review.]

176. The Ecology of *Habrobracon brevicornis*, a Parasite of the Larvæ of the Cotton Noctuid, and the Possibility of its Practical Utilization.

By I. S. Skoblo. (*Rpt. of Sci. Mtgs. of Leningrad Inst. Agr.*, Leningrad, 1940. From *Rev. App. Ent.*, xxx., Ser. A, 1, 1942, p. 25.) The author states that in many cotton-growing districts of Azerbaijan considerable numbers of larvæ of *Heliothis armigera*, Hb., are parasitized by *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and gives an account of laboratory investigations on its bionomics. It completed a generation in 6-9 days at 30° C. (86° F.) and in slightly over 9 days at 28° C. (82·4° F.). The numbers of eggs deposited averaged 300-400, and the absolute maximum was over 800. Other conditions being equal, the number of eggs laid per day depended on the number of larvæ available, and ranged from 5 or less to over 50. Pairing usually took place on the day of emergence, and the eggs deposited by unfertilized females gave rise exclusively to males. Individuals deprived of food, those given water only, and those that fed on the body juices of the larvæ lived for 3, 5, and 7 days respectively at high temperatures. The influence of relative humidity on the longevity of starved adults was marked only at low temperatures; at 13°-15° C. (55·4°-59° F.) and humidities of 0, 75 and 100 per cent., males survived for averages of 17·1, 40·4 and 29·7 days respectively. When supplied with carbohydrates the parasites lived for 50-70 days at 18° C. (64·4° F.) and longer at 13°-15° C., and ovipositing females lived for an average of 26 days at 23°-28° C. (72·4°-82·4° F.). Those prevented from ovipositing lived for an average of 30-35 days, and some for over 50 days at 28-30° C. The females readily inserted the ovipositor into and paralyzed the larvæ of various Lepidoptera, without ovipositing in them; at 28°-30° C. individual females paralyzed 10 or more larvæ of the mill Pyralid (*Ephestia kuehniella*, Zell.) in 24 hours. At 40°-42° C. (104°-107·6° F.) the parasites still actively paralyzed larvæ, but not at 8°-9° C. (46·4°-48·2° F.). In the absence of host larvæ no eggs were laid, and the mature ones in the ovaries degenerated. When supplied with carbohydrates, parasites that did not oviposit lived a long time even at high temperatures, and their ability to do so enables them to survive in the field during periods when no host larvæ are available. Females deprived of host larvæ for 15 days laid eggs in the larvæ soon after they were supplied, and their fertility was increased by almost 50 per cent. Of females prevented from ovipositing for about 30 days, up to 50 per cent. died at 28°-30° C., but the survivors readily attacked larvæ as soon as the latter were supplied. Females a month or more old paired and gave rise to a normal proportion of males and females, but when young females paired with old males the progeny consisted of males only. Parasites that did not oviposit for 15-30 days lived very little longer than those that oviposited from the day of emergence.

All stages of *M. brevicornis* were very resistant to high temperatures irrespective of humidity. Development was normal at 30°-35° C. (86°-95° F.), but was somewhat retarded at 40° C. and about half the pupæ died. The adults showed no signs of torpor at 40°-42° C. The parasite is well adapted to the climatic conditions of Azerbaijan, where the summers are hot and dry, and also to the high humidity that occurs within the immature pods of chick peas and cotton bolls, where parasitized larvæ of *Heliothis* are most often found. The adults are also very resistant to cold and probably overwinter in the field; in one experiment they survived exposure for about 3 months in the open to temperatures that gradually decreased from 6° to −17° C. (42·8°-1·4° F.), and revived when transferred to warm conditions. The pupæ withstood cooling down to −7° C. (19·4° F.), and eggs and larvæ that had been kept for about 3 weeks at 6°-2° C. (42·8°-35·6° F.) developed normally. From data on the numbers of eggs, larvæ and pupæ of *Microbracon* found in cotton fields on larvæ of *Heliothis*, and the rapidity of egg maturation, it is estimated that the moth could be controlled by releasing the parasite at the rate of about 4,000 females per acre.

177. A Survey of Cotton Seedling Diseases in 1941 and the Fungi associated with them. By P. R. Miller and R. Weindling. (*Pl. Dis. Rptr.*, xxv., **14**, 1941. Mimeographed. From *Rev. App. Mycol.*, xxi., **1**, 1942, p. 14.) During 1941, the fourth consecutive year of the cotton seedling disease survey, *Glomerella gossypii*, once more the predominant pathogen, extended its range slightly to the westward of previous locations in Texas and Oklahoma. *Rhizoctonia* (*Corticium*) *solani* was more generally prevalent than during the past three seasons, the total percentages in the 12 States covered by the survey being: *G. gossypii* 36·4, *Fusarium moniliforme* (*Gibberella fujikuroi*) 39·4, *C. solani* 2·8, *F.* spp. 6·3, *Alternaria* spp. 0·8, *Diplodia gossypina* 0·1, and unidentified species 7·4.

[*Cf.* Abstrs. **306, 752**, Vol. XVI.; and **175, 433**, Vol. XVII. of this Review.]

178. Diseases of Village Crops in Ceylon. By Malcolm Park and M. Fernando. (*Peradeniya Manuals No. IV.*, Ceylon Govt. Press, Colombo, 1941. Price Rs. 4.) This manual, in addition to providing the student with a grounding in the fundamentals of plant pathology, is intended as a book of reference that will assist him in the diagnosis and control of the commoner disorders of crop plants in Ceylon. Part I. General, deals with the following: The Structure and Behaviour of Fungi; The Invasion of a Plant by a Parasite; Symptoms of Plant Disease. Part II. is concerned with Types of Fungus Diseases. Part III. with Diseases of Village Crops. Part IV. with Plant Protection. Many illustrations are included.

179. Cotton Diseases in Texas in 1939. By W. N. Ezekiel and A. A. Dunlap. (*Pl. Dis. Rptr.*, **24**, 1940, p. 434. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 30.) Maps showing the approximate prevalence by counties, and a table giving estimated percentage reductions in yield by sections of the State, are included in this paper for the diseases named. For the entire State it is estimated that these diseases reduced the 1939 crop as follows: Root rot, caused by *Phymatotrichum omnivorum*, 6 per cent.; wilt, caused by *Fusarium vasinfectum*, 1·6 per cent.; *Verticillium* wilt, caused by *Verticillium albo-atrum*, 0·3 per cent.; and leafspot and bollrot, caused by *Bacterium malvacearum*, 2·7 per cent. Depending on the method of calculation, the total reduction in yield of 10·6 per cent. corresponds to a loss of either 337,000 bales or of about 575,000 bales.

180. On Two Alternaria Species Injurious to Cotton Fibre in Bolls. By Y. Nisikado *et al.* (*Ann. Phytopath. Soc. Japan*, x., **2-3**, 1940, p. 214-230. From *Rev. App. Mycol.*, xx., **10**, 1941, p. 461.) Two species of *Alternaria* (*A. macrospora* and *A.* (?) *gossypii*) were recently found attacking cotton fibres in nearly mature bolls in western Japan, the former also affecting the foliage while the latter is mostly confined to the fibres. The inoculation of cotton bolls of varying degrees of maturity resulted in discoloration or blackening of the fibres. The minimum, optimum, and maximum temperatures for the mycelial growth of both species were 5°, 27°-30°, and 36° C. respectively; and the minimum, optimum, and maximum hydrogen-ion concentrations *p*H 2, 5, and 10 respectively.

181. Stem Blight of Cotton caused by *Alternaria macrospora*. By L. Ling and J. Y. Yang. (*Phytopathology*, xxx., **7**, 1941, p. 664. From *Rev. App. Mycol.*, xx., **12**, 1941, p. 573.) A stem blight, known locally as "dry scar," of cotton is stated to be widespread and responsible for heavy losses, especially among varieties of Asiatic cotton (*Gossypium arboreum*) in Szechwan Province, China. The pathogen, which is believed to be a strain of *Alternaria macrospora*, produces on the stems, twigs, and leaf petioles of mature plants dark brown, roughly circular spots, gradually turning dark grey and assuming an elliptical or oval shape, the centres at the same time becoming deeply sunken and forming cankers. Diseased tissues usually split longitudinally or crack into fragments,

and finally the infected stem or twig breaks off at the canker, causing the death of part or all of the plant. From the upper part of the petiole the lesion may extend upwards into the midrib and veins near the leaf base. The pathogen was isolated in pure culture on potato dextrose agar, on which it throve at a temperature range of 16°-36° C., with an optimum at 28°. Growth took place over a wide range of hydrogen-ion concentrations, with maxima at *p*H 4·2 and at 7·6. The fungus is characterized by brown, septate, usually simple conidiophores 21-124 by 4-10μ, and brown, obclavate, conidia 40-288 by 8-29μ, including the beak (from 15 to 216μ long), and provided with 3-13 transverse and 3-5 longitudinal septa. *A. tenuis* was also isolated from diseased leaves only. In inoculation experiments American cotton (*G. hirsutum*) proved equally susceptible with *G. arboreum* to stem blight in the early stages of growth, but gradually acquired some degree of resistance. Wounding increased the incidence of artificial infection on the stems from 70 to 100 per cent. On inoculated bolls the initial minute, greyish-brown spots frequently turn purplish and coalesce, while in a very humid atmosphere conidia develop in sufficient numbers to impart a black cast to the centre of the lesion. In the field the disease is most prevalent in July, just before flowering, serious outbreaks being promoted by successive periods of rainfall and high humidity, in combination with fairly high temperatures. In 1938, for instance, a year with a wet July, 30 per cent. infection was observed in one field, whereas in 1939 the abnormally dry weather arrested the spread of the organism, the damage due to which was almost negligible. *A. macrospora* was experimentally shown to overwinter on dead, infected stalks in the field, while the possibility of seed transmission is indicated by its frequent development from surface-sterilized cotton seeds cultured on agar plates.

182. Factors affecting Mildew Behaviour on Textiles. By B. A. Harold. (*Amer. Dyest. Rpt.*, xxx., **11**, 1941, p. 274. From *Rev. App. Mycol.*, **xx.**, **12**, 1941, p. 587.) The writer's own observations on the factors affecting mildew development on textiles in the United States are reviewed in connection with the studies along similar lines of Burgess, Galloway, and others.

183. Molds: Development, Identification, Prevention. By J. Rière. (*Amer. Dyest. Rep.*, xxix., **8**, 1940, p. 211. From *Rev. App. Mycol.*, **xx.**, **12**, 1941, p. 588.) An abstract of a paper published in *Rev. Gén. Mat. Col.*, **55**, 1939, in which the following information is presented: Highly polymerized cellulose is attacked only by *Mucor* and *Aspergillus*. The general conditions requisite for the development of mould growth on textiles include humidity, absence of bright light, presence of nutrients, depletion of oxygen, a favourable hydrogen-ion concentration, and a temperature range of 20°-40° C. Black *Aspergillus* (*A. niger* group) grows very slowly at 7°, rapidly at 37°, and not at all above 43°; the white species (? *A. candidus* group) develops most profusely at 25°, and ceases to grow at 37°; while the optimum for the green *Penicillium* is 27°, development being arrested above 39°. Rayon, consisting of depolymerized cellulose, is stated to be particularly subject to fungal infection, being completely transformed into glucose by enzymatic action affecting cotton to the extent of only 30 per cent. Mildew growth liberates heat up to 70°, and this may aid in its detection. Microscopic examination is facilitated by the German practice of boiling in water, treating for a minute or two in a hot aqueous solution of phenol, lactic acid, and glycerine, and then immersing for several minutes in a solution of direct blue dye. After rinsing and reheating in the lactophenol solution to remove excess of dye, the mildewed parts remain coloured and the fibres are ready for examination. Among the most effective antiseptics may be mentioned salicylic acid, beta-naphthol, aristol, the sodium salt of para-chloro-

metacresol, hexylresorcinol, and emulsions of zinc or aluminium naphthenate. In this connection it should be remembered, however, that every antiseptic is not equally effective against all moulds, *Fusarium*, for instance, having been known to develop on a starch mixing containing 10 per cent. zinc chloride, while one or two species of *Aspergillus* utilize salicylic acid. Boiling the fabric may counteract the incipient stages of mould growth, or light chlorination or treatment with 2 per cent. ammonia water may be tried; but even if the visible effects are removed, the weakening of the fibre and modification of its dye affinity will persist.

184. Chemical Treatment of Soil to Control Root-Knot Nematode. By P. A. Young. (*Phytopathology*, **30**, 1940, p. 711. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 26.) Chloropicrin and carbon bisulphide as soil fumigants were effective in controlling the root-knot nematode.

[*Cf.* Abstr. **187**, Vol. XVIII. of this Review.]

185. Cotton Root Rot. By J. E. Simpson. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 15.) Cultures of the cotton root-rot organism tolerated over 100 parts per million of boron, though 200 parts per million reduced the growth. Iron salts stimulated growth up to 100 parts per million of iron, and in larger quantities decreased growth. Selenium at 10 parts per million caused some decrease in growth.

186. Chemistry and Growth of Cotton in Relation to Soil Fertility and Root Rot. By J. E. Adams *et al.* See Abstr. 220 in this issue of the Review.

187. Texas: Root-Rot Infected Cotton: Effect of Insect Control on Yield and Quality. By S. E. Jones. (*Iowa State Coll. J. Sci.*, **16**, 1941, p. 82. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 56.) An account is given of a study of the effect of insect control on the yield and quality of cotton from plants killed by root rot before the first normal picking. Plots were selected in fields in Texas where root rot was known to occur and there was already present an incipient flea-hopper infestation. Sulphur dust was used for the control of the flea hopper and calcium arsenate dust for boll-weevil control. Plants which died during each week were marked with a dated tag. The cotton was picked from the dead plants at the time of the first normal picking, and from the plants which were living at that time. The total yield from each group of plants was accurately weighed and quality determinations were made of seed and lint. All bolls which opened, regardless of size, were picked. Low yields from plants prematurely killed by root rot were not materially increased by insect control measures. Such plants produced only a small amount of low quality cotton even when there was no insect damage. It is pointed out that the factor which determines the profit to be made from controlling insects on land where cotton dies from root rot is the yield from living plants regardless of the percentage dying early in the season. If the yield from living plants is sufficient for profitable cotton production and insects are damaging the crop, control measures should be used.

188. Are Ammonium Salts Toxic to the Cotton Root-Rot Fungus? By L. M. Blank and P. J. Talley. (*Phytopathology*, xxxi., **10**, 1941, p. 926. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 75.) No evidence was obtained in the writers' further studies at the Texas Agricultural Experiment Station on the action of several concentrations ranging from 0·0063 to 0·075 M of ammonium sulphate and ammonium phosphate on cultures of the cotton root-rot fungus, *Phymatotrichum omnivorum*, in a synthetic nutrient solution, that the toxicity of these compounds to the pathogen is a property of the ammonium ion. An acid

condition, inhibiting further growth, rapidly develops in improperly constituted nutrient solutions with ammonium salts as the nitrogen source; this may be prevented by the addition of calcium carbonate in the proper amount to result in a 0·0125 M concentration in the final volume. Ammonium nitrogen was found to provide a good source of nitrogen for *P. omnivorum* in soil cultures, no evidence of toxicity being observed with concentrations up to 0·075 M. These data suggest that the beneficial effects of the treatment of diseased plants with ammonium compounds represent a response to the reception of additional supplies of available nitrogen rather than a reduction in the virulence of the pathogen, and it is doubtful, therefore, whether permanent eradication and control can be achieved by the use of ammonium salts.

189. A Photoelectric Method and its Use for Determination of Fungus Growth Rates. By L. A. Adair and E. J. Moore. (*Phytopathology*, xxxi., **5**, 1941, p. 448. From *Rev. App. Mycol.*, xxi., **10**, 1941, p. 462.) Details are given of an accurate and rapid photoelectric method for the determination of the amount of growth produced by the cotton root-rot fungus (*Phymatotrichum omnivorum*). The results secured by means of the technique agree closely with the data yielded by gravimetric methods for larger colonies, while for smaller ones the photoelectric instrument is more reliable.

190. Soil Bacteriological Studies on the Control of the *Phymatotrichum* Root Rot of Cotton. By R. B. Mitchell *et al.* (*J. Agr. Res.*, **63**, 9, 1941, p. 535.) Hunt clay to which no organic material was added permitted growth and persistence of *Phymatotrichum omnivorum* mycelium over the soil and root surfaces in open containers inoculated with segments of recently infected cotton roots, when maintained under favourable moisture and temperature conditions. Soil containing added organic matter, but otherwise similarly inoculated and maintained, either completely inhibited the growth of *P. omnivorum* or permitted initial growth which was followed by disintegration of mycelium. Under field conditions, cotton roots injured during the late summer or early fall showed pronounced increases in micropopulations associated with root surfaces; such increases were proportionately greater than those caused in soil by organic amendments and found inimical to the growth of the parasite.

The majority of *Phymatotrichum omnivorum* sclerotia buried in organic-amended soil were quickly destroyed; in contrast, the great majority of sclerotia buried in soil without organic residues persisted. Sclerotia remaining after subsidence of the microbial activity occasioned by fertilization persisted with little further reduction in numbers for several months; for the elimination of either mycelium or sclerotia, treatments with organic materials were especially effective during the period of increased microbial activity. Removal of the competitive effects of other microbes by soil sterilization, and subsequent reinoculation with *P. omnivorum*, permitted good growth of fungus mycelium, regardless of the amount of decomposition which the cotton roots or organic residues employed had previously undergone. Fungus survival was considered, therefore, to be limited by microbial inter-relationships rather than by food exhaustion. It was observed that during the early stages of incubation viable sclerotia disappeared more rapidly from amended soils than killed sclerotia; the importance of sclerotia-germination as one factor in soil sanitation was thus suggested. That other factors were operative also was suggested by the greater elimination of heat-killed sclerotia from organic-amended soil than from unamended check soil. Following field application of organic materials, together with early October ploughing, increased microbial activity, reduction of the incidence of dead cotton in the succeeding crop, and greater difficulty of sclerotia recovery from the amended levels in field soil were observed.

191. The Carbon Utilization and Carbohydrate Activity of *Phymatotrichum omnivorum*. By L. M. Blank and P. J. Talley. (*Amer. J. Bot.*, xxviii., **7**, 1941, p. 564. From *Rev. App. Mycol.*, xx., **12**, 1941, p. 574.) The growth of *Phymatotrichum omnivorum* on different types of carbohydrates was determined by quantitative measurements. The results varied according to whether sterilization was effected by autoclaving or by treatment with alcohol, but no adequate explanation was found for these differences. Glucose, fructose, and mannose proved to be the best carbon sources. The utilization of polysaccharides was found to be correlated with the ability of the fungus to hydrolyze them and the rates to which they were hydrolyzed.

192. Studies on the Root-Rot Disease of Cotton in the Punjab. IX. Varietal Susceptibility to the Disease. By J. C. Luthra and R. S. Vasudeva. (*Ind. J. Agr. Soc.*, xi., **3**, 1941, p. 410.) A very large number of varieties of cottons, both indigenous and exotic, have been tested with a view to finding a type resistant to root-rot disease in the Punjab. None of those tested has shown any appreciable resistance to the disease. Selfed seeds of apparently healthy plants in diseased plots did not yield resistant plants.

X. Effect of Certain Fungi on the Growth of Root-Rot Fungi. By R. S. Vasudeva and M. R. Sikka (p. 422.) The presence of *Trichoderma lignorum* and *Aspergillus niger* in the inoculum of *Rhizoctonia bataticola* and *R. solani* greatly interferes with the growth of the latter fungi. The hyphæ of *Trichoderma lignorum* and *Aspergillus niger* show a dissolving effect on the hyphæ of *R. bataticola* and *R. solani*. The activity of filtrates of the latter is reduced when these fungi are grown mixed with *Trichoderma lignorum* and *Aspergillus niger*.

[*Cf.* Abstrs. **307**, Vol. XIII.; **127**, **711**, Vol. XIV.; **139**, Vol. XV.; **509**, **709**, Vol. XVI.; **235**, Vol. XVII.; and **178**, Vol. XVIII. of this Review.]

193. Relation of Age of Cotton Plants to Susceptibility to Field Inoculation with *Phymatotrichum* Root Rot. By W. N. Ezekiel. (*Phytopathology*, **30**, 1940, 704. From *Circ.* 93, Texas Agr. Exp. Sta., 1941.) Summarizes an experiment in which cotton was planted at intervals during the season, and the plants all inoculated on July 28, 1939. Three months later the final notes showed:

Age of plants when inoculated, weeks:	14	10	6	3	0
Plants succumbing to root-rot, per cent.:	71·1	60·4	42·4	16·6	2·9

It is concluded that absence of symptomatic root rot on younger plants under field conditions is evidence of inherent differences between older and younger plants, rather than simply a matter of accidental escape.

194. Alkaloids from *Zephyranthes texana*, *Cooperia pedunculata* and other Amaryllidaceæ and their Toxicity to *Phymatotrichum omnivorum*. By G. A. Greathouse and N. E. Rigler. (*Amer. J. Bot.*, xxviii., **8**, 1941, p. 702. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 75.) The alkaloid lycorine, present in the bulb and root tissues of *Zephyranthes texana* and *Cooperia pedunculata* in concentrations of 0·02 and 0·04-0·05 per cent. respectively of the fresh weight, was shown in tests at the Texas Agricultural Experiment Station to prevent the growth of *Phymatotrichum omnivorum*, the agent of root rot of cotton and other crops, at a strength of 0·003 per cent., while a second alkaloid, presumed to be ψ-lycorine, isolated from the mother liquors of *C. pedunculata* at a concentration of approximately 0·002 per cent., acted similarly on the fungus at a strength of 0·0045 per cent. The total quantities of lycorine and ψ-lycorine present in *Z. texana* and *C. pedunculata* respectively were about 7 and 15 times as much respectively as was necessary to inhibit the development of *P.*

omnivorum. Various organs, notably the peripheral bulb scales, the shortened stem, and the roots of 11 other species of Amaryllidaceæ, were also found to contribute to the established immunity from root rot of members of this family.

195. Effect of Girdling and Topping of Cotton Plants on Survival of *Phymatrotrichum omnivorum* on the Roots. By W. N. Ezekiel. (*Phytopathology*, **30**, 1940, 704. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 24.) Summarizes further tests of girdling and topping of cotton plants at the advancing edges of root-rot spots. In this experiment *P. omnivorum* was recovered from 31·4 per cent. of check plants, from 21·8 per cent. of girdled plants, and from 9·5 per cent. of topped plants. The roots were apparently changed by both treatments sufficiently to reduce not only the percentage of plants on which *Phymatotrichum* survived, but also the extent and profusion of growth of the fungus from those roots on which it was still alive.

[*Cf.* Abstr. **238**, Vol. XVII. of this Review.]

196. Effects of Organic Amendments upon the Microflora of the Rhizosphere of Cotton and Wheat. By F. E. Clark and C. Thom. (*Soil Sci. Soc., Amer. Proc.*, **4**, 1939, p. 230. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 208.) Addition of various sources of organic matter to the soil produced striking changes in the microbiological populations of the soil mass in general, but had little effect upon the organisms associated with crop roots themselves. The experiments were carried out with wheat in soil infected with *Ophiobolus graminis* and in sterilized soil, and with cotton in soil infected with *Phymatotrichum omnivorum*. With respect to the effects upon root infections, it is concluded that "even though experimental controls of root-rotting parasites may be obtained by the inoculation of infested soil with saprophytic micro-organisms or filtrates thereof, it is questionable whether root surfaces can be protected on any practical scale in the field by inoculation procedures with common soil saprophytes."

197. A Study on the Infection of Cotton Seedlings by *Rhizoctonia solani*. By T. Nakayama. (*Ann. Phytopath. Soc. Japan*, x., **2-3**, 1940, pp. 93-103. From *Rev. App. Mycol.*, xx., **10**, 1941, p. 461.) The invading hyphæ of *Rhizoctonia* (*Corticium*) *solani*, inoculated into cotton seedlings in Petri dishes, proceeded along the slight depression in the epidermis above the junction of the epidermal cells of the root, hypocotyl, and cotyledon, the depression becoming intensified as the hyphæ adhered more closely. The root tips proved very susceptible to infection, the fungus penetrating the epidermis and branching out inter- and intracellularly into the endodermal region. Permeation of the root was likewise effected through the natural injuries associated with the extrusion of new secondary rootlets from the tap root. "Infection cushions" were the principal means of ingress into the hypocotyl, infection by simple hyphæ occurring rarely. The cuticle and stomatal apertures served as sites of entry into the cotyledons, the lower surface being penetrated chiefly through the latter channel, while both types of infection were present on the upper side.

198. Cottonseed Dusting in Relation to Control of Seedling Infection by *Rhizoctonia* in the Soil. By S. G. Lehman. (*Phytopathology*, **30**, 10, 1940, p. 847. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 348.) Non-dusted cottonseed and that dusted with 5 per cent. ethyl mercury phosphate preparation were planted in steamed soil previously inoculated with *R. solani*. Controls were run in non-inoculated soil. Counts of total emergence, living seedlings, and disease-free seedlings were made, and the results of statistical analysis are given. Dusted seed showed significantly greater improvement in seedling emergence on infested than on non-infested soil in plantings made soon after inoculating the soil,

but not in plantings made several weeks afterward. The percentage of seedlings living after emergence, also the percentage escaping stem infections, were increased by seed treatment in all tests, but the increase was not relatively greater by a statistically significant amount on inoculated than on non-inoculated soil. The results are taken to indicate that, so far as final seedling stands are concerned, such dusts applied to cottonseed before planting may be of little, if any, value. However, their protective action against fungi on the seed is unquestioned.

199. The Genus Fusarium. VI. A Recent Attempt at Mass Revision. By G. W. Padwick. (*Ind. J. Agr. Sci.*, xi., **5**, 1941, p. 663.) The history of the division of species of *Fusarium* into sections is outlined in relation to sections Elegans, Lateritium and Liseola. It is shown that the present conception of the sections Elegans, Lateritium and Liseola does not agree with the original descriptions. Elegans was split up into two sections, one retaining the original name and that of Liseola being given to the other. It is as difficult to place borderline members of the three sections in the correct section as it is to identify correctly the species within a section. Snyder and Hansen (1940) assume that, whereas the so-called species within the section Elegans (and similarly in other sections) must be regarded as one species, the major grouping into sections in Wollenweber's system and the original description of the section Elegans are acceptable. It is shown that this assumption is contrary to the facts as clearly indicated, firstly by careful consideration of the way in which the sections Elegans, Lateritium and Liseola were built up and described, and secondly by the existence of intermediate forms. It is concluded that, although the work of Snyder and Hansen (1940) and Hansen and Smith (1932, 1938) must eventually influence classification within the genus, proper revision can only result from the combined efforts of workers in a position to study the various *Fusaria* in their natural habitat. The ultimate classification will have to give sufficient weight to ecological factors and geographical distribution. Nomenclatural changes proposed up to the present are summarized.

[*Cf.* Abstrs. **445**, **446**, Vol. XVIII. of this Review.]

200. Wilt-Infected Cotton Plants: Response to Nutrients. By G. M. Armstrong and W. B. Albert. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 198. From *J. Text. Inst.*, xxxiii., **2**, 1942, A63.) Wilt-infected cotton developed worse and died sooner in culture solutions containing a low potash supply. Healthy plants absorbed more KNO_3, ammonia N, and Ca than wilt-infected plants; there was some evidence that dying plants gave up K to the solution. The rate of growth of plants was not affected by variations in Mg content of the solutions, but symptoms of Mg deficiency were observed in the foliage when the Mg. supply was low.

201. Wilted Cotton Plant: Intake of Tannin. By B. P. Strogonov. (*C. r. Acad. Sci.*, U.S.S.R., **29**, 1940, p. 628. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 555.) Sound and diseased cotton stems utilize tannin as a nutrient in both wood and bark, and develop tannin from infiltered glucose.

202. A Solution-Culture Infection Method used in the Study of *Fusarium* Wilt. By G. M. Armstrong. (*Phytopathology*, xxxi., **6**, 1941, p. 549. From *Rev. App. Mycol.*, xx., **11**, 1941, p. 531.) The following methods provided uniformly high percentages of infection on cotton seedlings in inoculation experiments with *Fusarium vasinfectum* at the South Carolina Agricultural Experiment Station. In the first series of tests the seed was germinated in sterilized sand in trays, and the most vigorous seedlings dipped into nutrient solution cultures of the pathogens for periods ranging from 10 to 90 minutes,

after which they were transferred to regular nutrient solutions. The high percentage (37·5) of re-isolations, even of weak isolates of the fungus from a resistant variety (Sea Island), indicates that this technique affords conditions approximating to those of severe field infection. The tank or tray method represents an attempt at the further simplification of seedling production for inoculations. Soaked seed is grown in boiled and soaked "excelsior" (wood-wool packing material) placed over the wire netting of ¼-inch mesh attached to the lower edge of a wooden frame fitted tightly into a metal tray 21 × 13 × 8 inches to the depth of 1 inch, and the roots allowed to grow into the water or nutrient solution below. Inoculations were made by dipping the roots in a nutrient solution culture of the pathogen in another tray 3 inches deep, which resulted in 80 to 100 per cent. infection. This method permits the use of a large number of plants per unit area.

203. Cotton Wilt and Root-Knot Investigation in Georgia. (*Ga. Ann. Rpt.*, 1940-41, p. 25.) In general a close positive relationship occurred between wilt resistance and root-knot resistance. Such varieties as Early Wilt 4 in 1-3, 4 in 1-4, Cleveland W.R.6, Rhyne Cook, and Early Cleveland W.R. combine resistance to both pathogens.

204. Cotton Plant: Wilt Resistance and Phosphorus Supply. (1) By A. L. Smith, (2) by D. C. Neal. (*Proc. Assen. Southern Agr. Wkrs.*, **42**, 1941, p. 199. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 25.) (1) In North and South Carolina and Georgia the average incidence of cotton wilt appears to be slightly greater if the P content of the fertilizer is increased from 6 to 12 per cent. in mixtures containing N 6 per cent. and K_2O 6 per cent. applied at the rate of 600 lb. per acre. In the Central Southern States there was no evidence of this effect. (2) The above effect of doubling the P content of the fertilizer was not observed in Louisiana.

GENERAL BOTANY, BREEDING, ETC.

205. Textbook of Botany. By E. N. Transeau, H. C. Sampson and L. H. Tiffany. (Harper and Bros., London, 1940. Price $4.00. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 335.) This new textbook of botany has several attractive features. It is printed in a clear and pleasant type, well bound, and provided with ample and very good illustrations. In the more important matter of the text we find a refreshing concentration on the dynamic aspects of the subject and on experiment and observation. The book is, in fact, designed to supplement practical work. This, combined with the attention paid to the relation of plants to man and the insistence on scientific methods of thought, justifies the publishers' adjective "modern." All aspects of botany are covered in the 53 chapters, and there are references for further reading. In future editions the authors would do well to revise the chapters on heredity. For example, the only instance of linkage given is one of complete linkage, and the intelligent reader, applying the principles stressed throughout the book, could pertinently ask how it is to be known that two genes are concerned, and not one, without getting any satisfactory answer. Later, on p. 481, we find crossing-over confused with translocation and segmental interchange as an "irregularity." In view of this error it is not surprising to find the obsolete distinction of the first division of meiosis as the "reduction division" perpetuated (not to say perpetrated) on p. 450. The elimination of blemishes of this type, which one would resignedly accept as inevitable in the average botany textbook, will make this book an outstanding contribution to botanical literature.

206. Plant Science Formulæ: A Reference Book for Plant Science Laboratories (Including Bacteriology). By R. C. McLean and W. R.

Ivimey Cook. (Macmillan and Co., Ltd., London, 1941. Price 7s. 6d. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 334.) This book should prove invaluable to every botanical worker; it contains, ready to hand, formulæ for practically every process normally used in the laboratory. It would certainly have saved the reviewer many hours of search in half-remembered sources for some elusive formula. The range of material is very wide. Perhaps most important to the cytogeneticist and breeder are the sections on fixatives, stains and other aspects of microscopic technique, the preparation of museum specimens, chemical and microchemical reagents, solutions for volumetric analysis and photographic reagents. In addition there are formulæ for the preparation of culture and nutrient solutions and solid media, a varied list of formulæ for use in the workshop, a list of suppliers, and many other useful pieces of information. The subject matter of the book is, on the whole, admirably chosen. While the reviewer has not checked large numbers of the formulæ, perusal of familiar ones gave the impression that the proof reading had been very carefully done. Two mistakes were noted in the section on viscosities (p. 163). In the section on photographic reagents it would probably have been more useful to give formulæ for modern fine-grain developers of the paraphenylinediamine type than to include the now rarely used pyro-soda and a formula for physical development, but for the first edition of a book of this type remarkably few such criticisms can be made.

207. Hunger Signs in Crops. A Symposium. Edited by Gove Hambidge. (The Amer. Soc. Agr. and The Nat. Fert. Assen., Washington, D.C., 1941. Price $2.50. From *Bull. Imp. Inst.*, xxxix., **3**, 1941, p. 277.) When agricultural research and experiment along any line have progressed to a practically useful stage the work must be carried one step further in passing on to the grower the knowledge gained. It is this step between the experiment station and the farmer that this book is designed to fill, by giving a concise account of the deficiency symptoms of the more important food crops, and thus to enable the farmer to recognize, in many cases, the causes of nutritional disorders in his crops and to take measures to correct them. The subject matter is presented in eight chapters, contributed mainly by members of staffs of experiment stations taking part in the original investigation work, and the crops considered are tobacco, maize, cotton, potato, vegetables and market garden crops, deciduous fruits, legumes and citrus. The symptoms are discussed under the headings of the different elements concerned, and in some cases keys are given to assist in the diagnosis, and chemical tissue tests are described as a means of confirming suspected deficiencies. The text is well illustrated with numerous excellent photographs, mostly coloured, which must prove an extremely valuable aid to recognizing the conditions described. No claim is made for the book as a final word on the subject; it simply represents a summary of the data so far available put into a form that the non-technical man can understand, and as such it is an excellent piece of work.

208. Processes of Organic Evolution. By R. Ruggles Gates. (*Sci.*, **93**, 1941, p. 335. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 272.) The author is of the opinion that both large and small mutations are important in evolution.

209. Studies on Nucleoli in Plant Cells. Parts 1-3. By S. Suematsu. (*Bot. and Zool.*, **5**, 1937, pp. 1876, 2042, 2217. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 272.) A survey of the contributions of research workers in different countries throughout the world to the various problems pertaining to the structure of the nucleolus, and the correct interpretation of its behaviour and its functions in the life of the cell.

210. Application of Infra-Red Photomicrography to Cytology. By G. Yamaha. (*Bot. and Zool.*, **5**, 1937, p. 2263. From *Pl. Bre. Absts.*, xi., **4**, 1941,

p. 272). A brief note on the use of infra-red photography in cytology, with some advice on the technique.

211. ORGANIZATION OF THE CELL AND THE CHROMOSOME THEORY OF HEREDITY. By M. L. Belgovsky *et al.* (*Bull. Acad. Sci., U.S.S.R.*, Ser. Biol., No. 5, 1940, p. 662. From *Pl. Bre. Abstr.*, xi., **4**, 1941, p. 270.) The authors give a careful and accurate exposition of genetical theory, of the experimental evidence on which it is based, and of the modifications made in the theory in accordance with recent developments and discoveries; a number of points on which misconceptions have arisen in the U.S.S.R. are cleared up. The editor adds a footnote to the effect that he " is not in agreement with many of the authors' views, and considers that a solution of the questions concerned will only be possible by a synthesis of the positive achievements of cytogenetics and developmental biology, the zygote and developing organism being regarded as a whole and in the closest relationship with the environment."

212. NEUE ERGEBNISSE UND PROBLEME AUF DEM GEBIET DES CHROMOSOMENBAUES. By L. Geitler. (*Naturwissenschaften*, **28**, 1940, p. 649. From *Pl. Bre. Abstr.*, xi., **4**, 1941, p. 272.) A concise and well-documented survey and critical analysis of recent cytological research on the gross and microscopic structure of chromosomes; specialization and its underlying structural basis and the chromonema; the chromomere and heterochromatin; and their nature and functions in relation to the gene concept. The author leans towards the view that changes in spiralization are responsible for many of the observed phenomena, and that the linear order of the genes is capable of interpretation on the assumption that they consist of side-chains along a continuous polypeptide chain serving as basis.

213. HOMOLOGOUS CHROMOSOME PAIRING: THE PHYSICAL PROBLEM. By A. C. Fabergé. (*Jour. Gen.*, **43**, 1-2, January, 1942, p. 121.) Homologous pairing of chromosomes is discussed in its physical aspects. The relevant facts about the cytology of pairing are examined, and the conditions stated which must be satisfied by any physical explanation. It is pointed out that these requirements are at first sight contradictory. A physical hypothesis to explain homologous pairing is put forward, making use of the Guyot-Bjerknes effect, a hydrodynamical phenomenon which results from the operation of Bernoulli's theorem. The justification for putting forward such a speculative hypothesis is that it appears capable of satisfying all the conditions imposed by known biological facts, facts which seem otherwise extremely difficult to explain. The physical consequences of the view proposed are examined in detail, and no impossibilities are found, provided it is assumed that the unit of homology is somewhat larger than the usual estimates of gene size, corresponding more nearly to a group of genes of the diameter of the visible leptotene chromosome.

214. THE INDIAN JOURNAL OF GENETICS AND PLANT BREEDING. We have received a copy of the first issue (Vol. I., December, 1941) of this new journal, which is the official organ of the Indian Society of Genetics and Plant Breeding founded in January, 1941. The journal will publish original articles by members of the Society on research in the field of genetics and plant breeding, cytology, physiology, and cognate sciences. The first issue contains the following among other papers: " Some Ideas and Opportunities for Plant Geneticists in India " (W. Burns); " Colchicine-induced Polyploidy in Crop Plants. II. Chilli (*Capsicum annuum*, L.)" (B. P. Paul *et al.*); " Studies in the Vernalization of Indian Crop Plants. I. Preliminary Experiments on Gram, Wheat, Chilli, and Soybean " (B. P. Pal and G. S. Murty). The cost of the present issue (the only one in 1941) is Rs. 8 in India and Rs. 8-8 abroad. Future publication will be twice a year,

the annual subscription (for non-members) being Rs. 15 in India, and Rs. 16 for other countries, inclusive of postage. We wish the new journal every success.

215. A Short Review of Genetical and Plant Breeding Work in Cotton, with Suggestions for the Future. By K. Ramiah. (Ind. Cent. Cott. Comm. 2nd Conf. Sci. Res. Wkrs. Cotton, India, Genet. and Pl. Bre. Paper No. 1. From *Pl. Bre. Absts.*, xii., 1, 1942, p. 10.) The topics discussed in this short review are selection, quantitative inheritance, breeding for quality, choice of parents for crossing, discriminant function, correlation and linkage, breeding for wilt resistance, species relationship, collection of breeding material, and maintenance of purity of strains. Suggestions are made for future genetical and breeding work with cotton in India. The author emphasizes the inter-relationship of genetical and plant-breeding work.

216. Plant Breeding and Genetical Work in India. By K. Ramiah. (*Proc. 28th Ind. Sci. Cong.*, Benares, 1941, Pt. II.) A report of the presidential address delivered by Mr. Ramiah to the Agricultural Section of the Congress, in which he gives a brief outline of the plant breeding and genetical work in India, mainly in connection with cotton and rice, and indicates in what manner the advances in genetical science can influence plant breeding practices. The subject is discussed under the following headings: *A Survey of Plant Breeding Results:* spread of improved types; need for improved agricultural statistics. *Methods of Breeding:* selection in natural and in hybrid populations; mixture of pure strains. *Development of Genetical Science:* genetical work in India. *Genetics in Relation to Plant Breeding:* quantitative inheritance; heterosis; physiological and genetic correlations; use of "discriminant function"; wide crosses; limitations in wide crosses. *Maintenance of Purity of Strains. Organization of Genetical Research. Genetical Work and the Universities.*

217. Average Excess and Average Effect of a Gene Substitution. By R. A. Fisher. (*Ann. Eugen.*, 11, 1941, p. 53. From *Pl. Bre. Absts.*, xii., 1, 1942, p. 5.) The author clarifies and develops the theory of gene substitution. He stresses the difference between the fundamental quantities of the average effect and average excess. It may be assumed that these are equal only for groups for which random mating has for long been the rule. In the light of this distinction the author enters on a critical discussion of a law of "increase in biological fitness" put forward by Sewall Wright (1937). The author's principal objection to Wright's formula is that it yields selection intensity from an *average* behaviour of the species as a whole (change in average survival value) without regard to competition among individuals. He amplifies this point by discussing a hypothetical example which is examined in detail. A hypothetical factor is assumed to affect self-fertilization, and selective activity is shown to be present although there is no change in the average survival value of the population. The theory of this example involves an interesting mathematical problem. The frequencies of three types of fertilization are linked from generation to generation by three non-linear recurrence equations of a type frequently met with in genetic problems. An approximate general solution of these equations is given with the help of power series, and the accuracy of the solution is checked in a special case where the recurrence formulæ were worked out by the tedious numerical process.

218. Selektion und Stammesentwicklung (Selection and Phylogeny). By W. Ludwig. (*Naturwissenschaften*, 28, 1940, p. 689. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 272.) This is a critical essay on the problem of the mechanism or mechanisms of evolution and phylogenetic development in the plant and animal kingdoms. Evidence bearing on the relative significance of selection and

mutation as factors in the evolutionary process is discussed, and the need for limiting the importance of chance as a causal agency in selection is stressed. An extensive bibliography of recent literature is appended.

219. The Calculation and Precision of Linkage Values from Tetrad Analysis. By K. Mather and G. H. Beale. (*Jour. Gen.*, **43**, 1-2, January, 1942, p. 1.) The usual type of genetic experiment utilizes only one of the four spores resulting from meiosis in a mother cell. In some organisms it is possible to make a genetical analysis of all four spores, and such analyses will yield considerably more information about linkage of two genes, or of gene and centromere, than does the common type of genetical experiment. The observations made on different spores of the same tetrad are, however, not independent, but the problems of estimation which arise may be overcome by the method of maximum likelihood. Estimation of the recombination fraction and its variance from completely and incompletely analyzed tetrads with and without viability disturbances is considered. The relative values of the various types of data are given, and the appropriate method of combining them in a single estimation is also given. Special attention is paid to the cases of close linkage of two genes, and linkage of a gene to the centromere. The calculation of coincidence values and their variances is discussed. Many of the calculations are illustrated arithmetically, using data from segregation in *Neurospora crassa*.

220. Chemistry and Growth of Cotton in Relation to Soil Fertility and Root Rot. By J. E. Adams *et al.* (*Soil Sci. Soc. Amer. Proc.*, **4**, 1939, p. 329. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 348.) Data analyzed by variance methods are quoted to show that highly significant reductions in mortality from *Phymatotrichum* root rot were associated with 15-0-0, 9-3-0, and 9-3-3 fertilizers, and highly significant increases with the 0-15-0 ratio of ingredients. In the tests reported, the N contents of root-bark samples on August 15 and September 20, and of leaf samples on July 20 and August 15, were affected sufficiently to give highly significant negative values for the correlation coefficient r between N contents and mortality data. The value of r between the P_2O_5 contents of root bark on September 20 and mortality at a comparable date was positive and highly significant. A highly inverse correlation was found between P_2O_5 and N contents of root-bark samples taken on September 20. These data indicate that the chemical composition of root bark and leaves of cotton, as affected by fertilizer treatment, is correlated with the mortality of cotton on the plats from which the samples were taken. Differences in the incidence of the disease as affected by fertilizer treatment were not as numerous or as outstanding for the soils of the Houston as for those of the Wilson series. The turning under of the stalks as soon as the cotton was picked, with bedding later in the season, as compared with the prevailing practice of bedding in December or January, resulted in outstanding reductions in mortality. This appears to be due to an effect on the fungus parasite, abetted by chemical composition.

221. A Heritable Female-Sterile Type in Cotton. By G. N. Stroman. (*J. Hered.*, **32**, 1941, p. 167. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) A common form of " rogue " in Acala No. 8 cotton is a type that has no bolls and is very tall. Segregations in the progenies of normal plants approximate to 3 normals : 1 sterile.

222. Some Factors that Influence the Immediate Effects of Pollen on Boll Characters in Cotton. By H. J. Fulton. (*J. Agr. Res.*, **63**, 8, 1941, p. 469.) Strains of cotton inbred from 11 to 20 years or more were used to test the immediate effects of pollen on boll characters. Emasculated flowers of Acala cotton were pollinated with (1) Pima pollen, (2) Acala pollen, and (3) Hopi pollen, the Acala pollen having been taken from plants of the same inbred strain

that comprised the pistillate plants receiving all three cross-pollinations. Significant differences among means for the several cross-pollinations were obtained in number of seeds per boll, in seed index, in lint index, in fibre length, and in boll-maturation period. It is shown that effects upon the expression of these characters by differences between (1) different years, (2) different days of anthesis in the same year, and (3) different individual plants used as pistillate parents are so great as conceivably to mask completely the effects, if any, of different pollens. The difference between means for different years approximated the average difference between means for the several cross-pollinations in all characters except number of seeds per boll. In this character the difference, although highly significant, was smaller than the minimum difference between means of cross-pollinations. In both seasons the maximum difference among means for successive days of anthesis and among means for each of the individual pistillate plants exceeded the maximum difference among means of the several cross-pollinations. An assumed nutritional factor was shown to affect the expression of seed index, of fibre length, and probably of lint index. This suggests that a difference among the several pollens in ability to fertilize a high percentage of the ovules was another factor that determines the effects of cross-pollinations. The influence of these various factors, and undoubtedly of others not covered by this study, are so intermingled that it is impossible to rank them in the order of their importance.

223. Influences of Enforced Self-Pollination in Cotton on Fruiting and Yield. By I. R. Krasovskii. (*Jarovizacija*, **1**, 34, 1941, p. 104. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) Seed from plants of a number of varieties of *Gossypium hirsutum* that had been artificially self-pollinated for a number of years was compared with seed from the same varieties open-pollinated. The plants of the control were taller, flowered 2-3 days earlier and ripened sooner; they had a greater number of bolls per plant and of seeds per boll, especially in comparison with the varieties that had been selfed for longer periods.

224. Cottonseed Epidermal Cells: Structure. By W. Wergin. (*Planta*, **30**, 1940, p. 800. From *J. Text. Inst.*, xxxii., **21**, 1941, A583.) The outer walls of the epidermal cells of cottonseed (*G. barbadense*) show a foliar structure. Before these walls grow out into hairs, areas of thickening with pronounced double refraction appear on them; they apparently represent reserves of wax-like wall material.

225. Seed Cover and Plant Colour and their Inter-relations with Lint and Seed in Upland Cotton. By J. O. Ware. (*J. Amer. Soc. Agron.*, **33**, 1941, p. 420. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) F_2 segregations were studied in two crosses between two plants from different lines of a red variety of Upland cotton (Winesap) and two plants from the same line of the No Lint variety. The two Winesap parent plants differed in degree of seed cover—one had seeds completely covered with fuzz, while the other plant had a seed cover approximating to Thadani's felted. Plant colour and seed cover (degree of fuzziness) were found to be inherited independently. Naked seeds and sparse lint are controlled either by two completely linked genes or by the same gene. The F_2 segregated into three general seed cover classes—fuzzy, naked-adherent, and naked. The highest lint levels were found in the fuzzy plants of the F_2 generation and very low lint levels in naked plants. The changes in lint level with different degrees of seed cover were also investigated. Plant colour was found to be independent of lint level, and seed index also did not appear to be associated with seed cover. High seed index might possibly be associated with green plant colour.

226. Cotton Leaf: Area Measurement. By N. C. Thirumalachary. (*Ind. J. Agr. Sci.*, **10**, 1941, p. 835. From *Summ. Curr. Lit.*, xxi., **24**, 1941, p. 630.) A study was made of methods of determining leaf areas based on measurements of the area of the rectangle enclosing the entire leaf, the area of the rectangle the sides of which are formed by the length of the midrib and the maximum breadth between the basal lobes, and the area of the rectangle whose sides can be represented by the length of the midrib and the breadth between the tips of the second and fourth lobes respectively, and a method which involves matching each leaf against artificially prepared standards of known area cut out of ordinary cardboard. For the last method, about 100 leaves of ages ranging from 10 to 60 days were collected from a field of Cambodia cotton plants and their individual outlines sketched carefully on a piece of cardboard. The area of each of the 100 sketches was then measured twice by means of a planimeter, and the average of the two readings was noted on each sketch. Thirty of these sketches were chosen so as to constitute an ascending scale of areas. The leaf under test was then matched against its probable compeer among the standards. With a little experience the excess of deficit over the standard was easily estimated by mere eye judgment. Results obtained by the four methods are given, together with actual planimeter measurements, and the results of statistical analyses of the data are discussed. It is shown that the cardboard method is superior to the other methods in precision and in the ease and rapidity with which it can be carried out. It has a special advantage in that the leaves can be measured without being removed from the plant or injured in any way.

227. Inheritance of Smooth and Pitted Bolls in Pima Cotton. By E. Gordon Smith. (*J. Agr. Res.*, **64**, 2, 1942, p. 101.) Although the presence or absence of pits on the bolls is of taxonomic importance in the genus *Gossypium*, the inheritance had not been analyzed successfully previous to the present study, according to Kearney and Harland. The latter suggests that Mendelian segregation may be obscured in interspecific cotton crosses by the "large number of different genetical backgrounds upon which the given pair of alleles would manifest themselves." This hypothesis offers an explanation for the difficulty encountered by investigators who have worked with interspecific hybrid populations. The present success with the pitted-boll character may be accounted for on the assumption of similar genetic backgrounds in P Hope and ordinary Pima. Even though P Hope may have originated by natural hybridization between Pima (*G. barbadense*) and Upland cotton (*G. hirsutum*), a Pima-like genetic background could have been acquired by repeated natural back-crossing on Pima prior to the discovery of the parent P Hope plant. The symbols B^p and B^s respectively are proposed for the allelic boll surface characters, pitted and smooth.

228. The Effect of Environment on Fibre Maturity of Cotton. By A. N. Gulati. (*Ind. J. Agr. Sci.*, xi., **4**, 1941, p. 566.) The effect of environment, as provided by agronomical factors, on fibre maturity of cotton, for which material was kindly supplied by the Institute of Plant Industry, Indore, is described in this paper. The material consisted of two sets of samples. The first set consisted of samples of P-A/289F and Mollisoni cottons grown at Sriganganagar (Bikaner). The agronomical factors included in this experiment were: (i) Sowing dates in May and June, (ii) presence and absence of preparatory cultivation, (iii) heavy and moderate irrigations, (iv) cake, Nicifos and no-manure, and (v) 6-inch and 12-inch spacings. From a study of these results the following conclusions are drawn, which should be regarded as tentative owing to the small number of samples in this set: (1) Out of the two sowing dates, May suited P-A/289F, while June helped Mollisoni to attain its highest fibre maturity. (2) Preparatory

cultivation did not prove beneficial to either of the two cottons in respect of fibre maturity. Its absence, however, helped Mollisoni when it was June sown. (3) Heavy irrigation comprising 11 waterings as compared with moderate irrigation of 6 waterings was helpful in raising the fibre maturity of both the cottons. Heavy irrigation with May sowing formed a good combination for P-A/289F. (4) The application of Nicifos to P-A/289F was evidently better than no-manure when the cotton was sown in May, while cake and no-manure suited Mollisoni better than Nicifos. (5) Six-inch spacing as compared with 12-inch spacing improved the fibre maturity of Mollisoni.

The second set consisted of samples of Cambodia cotton grown in two Rajputana States—Bundi and Ajmere. The agronomical factors studied in this experiment were: (i) three sowing dates in March, May, and July, (ii) adequate and scanty irrigations, (iii) presence and absence of basal dressing of manure, and (iv) three top dressings of manure. The following conclusions are drawn from the results: (1) Locality has a significant effect upon maturity percentage, Ajmere yielding higher percentages of mature fibre as compared with Bundi. (2) The earlier-sown samples gave higher percentages of maturity in both the localities. Thus, sowing in March proved the best and sowing in July the worst in respect of this property. The bad effects of late sowing could, however, be remedied by heavy irrigation. (3) Adequate irrigation yielded higher fibre maturity than scanty irrigation. (4) The application of sheep dung at the rate of 32 mds. per acre plus ammonium sulphate at the rate of 50 lb. per acre as basal dressing had a depressing effect upon fibre maturity as compared with no basal dressing. (5) Top dressings with sheep dung alone (T_2) and sheep dung plus ammonium sulphate (T_3) as compared with no top dressing (T_1) had a beneficial effect upon maturity percentage, T_3 giving better results than T_2. Thus, the application at the same rate of the same manure—*i.e.*, sheep dung plus ammonium sulphate—did not prove beneficial as a basal dressing, but proved beneficial when applied as a top dressing.

229. Variation in the Measurable Characters of Cotton Fibres. II. Variation among Seeds within a Lock. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., **5**, 1941, p. 703.) The following conclusions are presented: The mean fibre length is nearly constant in Co. 1. In Co. 2 it rises gradually from the first position to the last, while in K546 it rises up to about the middle of the lock and falls later on. The fibre weight per cm. does not indicate any variation in Co. 1 and Co. 2 except for a higher value in the first position. But a consistent fall from first to last position is noted in K546. The unit fibre weight shows no variation in Co. 1 and Co. 2, but exhibits a gradual fall in K546. The number of fibres per seed as well as the number per unit area gradually decreases towards the end of the lock. The rise noted from the first to the second position in the former character is absent in the latter. The variation in the maturity cannot be assessed definitely on account of the absence of complete data. A study of the inter-relationships among the different characters discloses the following points: The seed weight is positively associated with many of the characters, reflecting the general trend of all-round growth. The lint weight is more prominently associated with the number of fibres per seed than with the weight of the whole fibre in both Co. 1 and Co. 2. In K546, however, it is equally associated with both. The ginning percentage is strongly associated with the lint weight. The negative correlation of the ginning percentage with seed weight, generally reported by different workers among different varieties, is not confirmed in the present case among seeds within a lock. The unit fibre weight is more dependent on the weight per unit length than the length of the fibre.

[*Cf.* **Abstr. 740**, Vol. XVI. of this Review.]

230. Asiatic Cottons: Linkage Relation of White Pollen Factor. By G. K. Govande. (*Ind. J. Agr. Sci.*, **10**, 1941, p. 842. From *Summ. Curr. Lit.*, xxi., 24, 1941, p. 630.) Coconada 45, a strain with white pollen, was crossed with both A8 Burma lasciniated and N6 multiple recessive in order to discover the linkage relations of the white pollen factor in Asiatic cottons. No back-cross data are available, but other results obtained are presented which show clear evidence of linkage between the white pollen and leaf nectaries with cross-over values of 18·3 per cent. and 14·7 per cent. in the F_2 and F_3 generations respectively. As regards other genes—namely, for petal colour, anthocyanin pigment, leaf shape and lint colour—the deviations from the expected ratio are not significant, indicating occurrence of free assortment.

231. Inheritance in Cotton. By D. T. Killough *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 63.) Experiments are being conducted to evolve hairy types of cotton which retain poison better in insect control and which may be used as stocks for further testing and comparison with the better commercial varieties.

The inheritance of leaf shape and colour and their effect on yields was investigated further, and the pure types combining the desired characteristics were grown for the purpose of obtaining seed for testing under field conditions to compare their yields with the yields of normal green-leaf stock used as the recurrent parent. Lines differing by only one main character—namely, okra-leaf, red-leaf, bronze-leaf, and virescent yellow leaf—have been developed through six generations of back-crossing to an inbred, normal Upland plant. If any of these lines do not differ significantly, it will indicate that the particular character has no adverse effect on yield, and consequently may be used as a genetic marker for transfer to a superior variety.

Fibre fineness and length in relation to the yield and cleaning qualities of cotton are studied in crosses between Lightning Express and strains with short, coarse fibres, and spinning tests of the new hybrid types will be carried out and the inheritance of the physical properties of the fibre investigated. Several very early maturing strains of cotton were obtained from Sodova, Bulgaria, and were crossed with some of the better Texas varieties for a study of the photoperiodic response to length of day and also of inheritance of earliness with other important economic characters.

232. Inheritance of Cluster Habit and its Linkage Relation with Anthocyanin Pigmentation in Upland Cotton. By J. Winston Neely. (*J. Agr. Res.*, **64**, 2, 1942, p. 105.) Crosses were made between two strains of Upland cotton characterized respectively by red plant, non-cluster habit (R_1^{ro}, R_1^{ro}, *Cl*, *Cl*) and green plant, cluster habit (r_1^{ro}, r_1^{ro}, *cl*, *cl*). Although the F_1 differed slightly from the non-cluster parent, the non-cluster characteristic is dominant, or practically so. In the F_2 and back-cross generations, good 3 : 1 and 1 : 1 ratios of non-cluster to cluster were obtained, verifying the previous conclusion that the characteristic is controlled by one genetic factor pair. Detailed studies in linkage detection and linkage estimation show that the R_1^{ro} and *Cl* genes belong to the same linkage group and that the percentage of recombinations under the conditions of this study is not far from 18·5. These results verify the previous reports regarding the existence of the linkage of the two genes. However, the recombination fraction determined in these studies is somewhat higher than that previously reported.

233. Green Lint Cotton: Wax Content. By C. M. Conrad. (*Sci.*, **94**, 1941, p. 113. From *J. Text. Inst.*, xxxii., **10**, 1941, A468.) The lint from *Gossypium hirsutum* (var. Arkansas green lint) differs from that of ordinary strains of Upland cotton not only in its bright green colour and soft feel, but

also in its remarkably high wax content of 14-17 per cent. based on the dry weight, compared with 0·4-0·7 per cent. for most cotton lint. The wax may be removed readily from green lint cotton with hot ethyl alcohol, chloroform and other organic solvents, and is also soluble in acetic acid and cold pyridine. With alcohol and most other solvents the hot extract is coloured deep amber in transmitted light, but fluoresces a deep velvety green in reflected light. The green colour of the lint is not changed appreciably, if at all, by the extraction. When the hot alcoholic solution cools to 50°-55° C. most of the wax separates in poorly defined yellow crystalline flakes which are noticeably anisotropic between crossed nicols. The crude wax can be separated into at least three fractions of different properties by means of 95 per cent. ethyl alcohol and ethyl ether at room temperature. X-ray diffraction patterns show that at least a part of the wax occurs in a crystalline form in the fibre, and is highly oriented, the most prominent diffraction arcs arising from crystal planes perpendicular to the fibre axis. Microscopic observation of the fibres in longitudinal mount or of their cross-sections does not reveal definitely the location of the wax. In cross-section an outer greenish translucent ring which constitutes one-third to one-fourth of the thickness of the wall may be observed on sharply focussing. When the fibre cross-sections are strongly swollen with cuprammonium solution a number of similar greenish translucent concentric rings may be seen throughout the wall.

234. A Note on Deterioration and Acclimatization of Strains. By K. Ramiah and P. D. Gadkari. (Ind. Cent. Cott. Comm., 2nd Conf. Sci. Res. Wkrs. Cott. India, *Genet. and Pl. Bre. Paper No. 16.* From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 10.) Deterioration of a particular strain or variety of cotton under cultivation may be due to either non-genetic or genetic causes. In the non-genetic causes the authors include mechanical mixture of seeds, natural crossing in fields, and extension of the cultivation to areas not particularly suited to that variety. The genetic causes for deterioration are grouped under either segregation or mutation and selection pressure. It is pointed out that strains released for distribution consist of several genotypes differing in their constitution as regards many physiological characters. Acclimatization is discussed in the second part of the article. It is suggested that acclimatization must mean the existence of genetic variability in the material and the consequent selective action of environment on the more favourable genotypes. The "New Place Effect" refers primarily to the temporary and permanent changes, peculiar to the place alone, suffered by the strain in response to a new environment.

235. A Technical Method of Selection in Cotton for Immunity against Wilt. By T. Fahmi. (*Egypt. Agr. Rev.*, **19**, 1941, p. 6. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) The author describes a method adopted for breeding immune strains which combine high yield and better qualities. Seedlings are planted in pots containing contaminated soil: these pots are kept for 40 days in a greenhouse the temperature of which is 25 C. Afterwards the plants apparently immune are transplanted in the field, where they are bred for several generations until immune strains of high qualities and of uniform genetical constitution are produced. The author places great importance on the stock used for selection. The most appropriate stock is produced by artificial hybridization between immune and non-immune varieties carefully selected for the purpose. The author concluded that those healthy exceptional plants which exist among non-immune strains when used as stock for selecting and breeding for immunity are often unsuccessful.

236. Russia: New Wilt-Resistant Lines of Upland. By I. Veh-Zade. (*Sovetskii Khlopok*, **4**, 1940, p. 39. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 307.) Selections combining resistance to *Verticillium* wilt with high lint length and

ginning percentage have been obtained. Line 01363 also has lint of exceptional strength and has beaten the best Upland varieties in yield of lint. Line 01367 was selected from variety 114, from which it differs in lint length (32·2 mm. against 29·4 mm.), larger bolls, and 28 per cent. better survival on wilt-infected soil. Even those plants that contract the malady do so only at the end of the growing season, and not at the period of major attack.

237. A Statistical Study of the Relation between Quality and Return per Acre in Cotton. By V. G. Panse. (*Ind. J. Agr. Sci.*, xi., **4**, 1941, p. 546.) The relationship between quality and price has been studied in data of spinning tests and commercial valuations of samples grown in Malwa over a period of 8 years from 1931 to 1938. It has been shown that the premium for quality is small, and this result has been confirmed by an examination of other Indian cottons. Yield, therefore, should receive primary consideration when introducing superior cottons. Cambodia cotton has been compared with local *desi* cotton and Malvi 9 for yield and money return per acre. It has been shown that Cambodia, in spite of its superior quality, cannot be recommended to the cultivators on account of its lower yield. The effect of the relationship between quality and price on cotton breeding policy has been discussed, and it has been pointed out that a premium for quality adequate to compensate for more than quite a small loss in yield is not ordinarily realized. Therefore, yield and ginning percentage must be taken into account in breeding for superior quality.

238. Studies on the Periodic Partial Failures of Punjab-American Cotton in the Punjab. III. The Uptake and the Distribution of Minerals in the Cotton Plant. By R. H. Dastur and A. Ahad. (*Ind. J. Agr. Sci.*, xi., **2**, 1941, p. 279.) *Summary.* The mineral composition of the different parts of the Punjab-American (4F) and *desi* (Mollisoni) cotton plants at fortnightly intervals is studied with the ultimate object of determining the nature of the nutritional disorder that sets in in the American plants when they suffer from "*tirak*" (bad opening) disease in the Punjab. The quantities of different minerals in the American plant are as under, on percentage dry matter: 2·2 gm. of CaO, 2·1 gm. of K_2O, 1·7 gm. of N_2, 1·5 gm. of SO_4, 0·35 gm. of P_2O_5, 0·44 gm. of MgO, 0·32 gm. of Cl_2, and 0·06 gm. of $Al_2O_3+Fe_2O_3$. The mineral composition of the *desi* plant is the same except that there is less of K_2O (1·7 gm.) and more of CaO (2·4 gm.) and SO_4 (1·7 gm.) in this variety as compared with the American plant. The percentage composition of ash of the two varieties shows the same differences as stated above. Leaves and bolls contain largest amounts of all minerals. The leaves contain more potash than the bolls in the American, while the reverse is the case in the *desi* variety. The mineral contents of the bolls of the *desi* plants are higher than those of the bolls of the American plant. Percentages of lime and sulphates in dry matter of the roots, stems, and leaves remain nearly constant in both varieties at all stages of growth. Nitrogen, phosphoric acid and iron contents of the leaves diminish, while potash diminishes more in the stem and root than in the leaves. The remaining minerals diminish in all the parts as the plant matures. Thus the demand of the bolls for lime and sulphates appears to be met directly from the soil, and for potash it is met mostly from the stems and roots and partly from the leaves in the *desi* plant only. Nitrogen, phosphoric acid and iron travel to the bolls from the leaves, and the remaining minerals from all parts of the plant to the bolls. The maximum uptake of all minerals occurs at the flowering stages in both the varieties, the peak of the maximum being reached by the middle of September in American and the end of September in *desi*. This is the period when the maximum increases in the dry weights of the plants are also found to occur in both the varieties. The study of the distribution of minerals and nitrogen in different parts of the

plants shows that the bolls of the *desi* plant contain more of each mineral than the leaves, while the leaves of the American plant at maturity contain greater percentages of the total minerals than the bolls. Thus, the important minerals like potash, magnesia, phosphoric acid, iron and aluminium, and chlorides remain accumulated in the leaves of the American plant. This is not so in the *desi* plant. This difference between the two varieties may be due to the greater percentage of dry matter of the bolls per plant in *desi* than in American. The concentrations of nitrogen in the bolls and leaves in the two varieties are nearly the same. The percentages of total nitrogen in the leaves of both varieties at maturity are also equal.

IV. Relation between Nitrogen Deficiency and Accumulation of Tannins in Leaves. By R. H. Dastur. (*Ind. J. Agr. Sci.*, xi., 2, 1941, p. 301.) Formation of tannin deposits in the mesophyll cells of the leaves of the 4F Punjab-American cotton plants, which later developed premature yellowing and shedding of leaves and bad opening of the bolls, was described in a previous paper by the author. In the cotton season of 1937-38, whilst making periodic examination of the leaves, it was noticed that these deposits were absent in plants from plots treated with ammonium sulphate, while they were present in the leaves of plants from the control plots and from plots manured with potash and superphosphate. It was, therefore, decided to investigate the possible relationship between the formation of tannins in leaves and their total nitrogen content in the season of 1938-39. Microscopic method for testing the presence of tannins in leaves was replaced by a chemical method. Leaves of plants from two field experiments, in which nitrogenous fertilizers were among the treatments, were tested periodically for tannins, and it was found that a test for tannins was given by the leaves of plants from the control plots by the beginning of September, while the test was negative in leaves of plants from plots manured with nitrogenous fertilizers. Analysis of the leaves for total nitrogen showed that the nitrogen content of the leaves giving a negative test was significantly higher than the nitrogen content of the leaves giving a positive test. Similarly the yield and the opening of the bolls—*i.e.*, weights of seed cotton per boll—were higher on the manured plots than on the control plots. The above relationship between tannin and nitrogen deficiency was again confirmed in the cotton season of 1939-40. A positive tannin test was generally given by leaves whose nitrogen content was in the neighbourhood of 2·5 per cent. of the dry matter. By sowing the cotton crop later than the normal practice tannins developed later in the leaves than in the leaves of early-sown plants. The analysis of the leaves under different sowing dates again confirmed the same relationship between the nitrogen content of the leaves and tannins. A positive test for tannins in leaves of the cotton plant in the Punjab at its flowering phase (August-September) is thus an index of nitrogen deficiency at that stage. This fact was made use of in detecting and remedying the nitrogen deficiency in cotton crops during the 1939-40 season. The test for tannins was made in 45 fields located in different districts in the third and fourth weeks in August. Whenever a positive test was recorded, sulphate of ammonia at the rate of 2 mds. per acre was applied. Controls were also included. The fertilizer was also applied in some fields where a negative test was given. In the former case the response to the fertilizer was high and profitable, while in the latter the response was either nil or low and was uneconomic. The practical possibilities of this test are discussed.

[*Cf.* Abstr. **724**, Vol. XVI. of this Review.]

289. Colchicine to Aid the Plant Breeder. By S. Bettoney. (*Missouri Bot. Gard. Bull.*, **28**, 1940, p. 119. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 263.) A popular account of the use of colchicine for chromosome doubling.

240. A New Method of Plant Breeding. By J. W. Boyes. (*Pr. Bull. Dpt. Ext. Univ., Alberta*, **26**, 1941, p. 5. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 1.) A popular account of the production of polyploids by colchicine, etc., and of the possible uses of induced polyploidy in plant breeding.

241. Methods of Detecting Polyploid Plants at Different Stages of Development. By L. P. Breslavez. (*Bull. Acad. Sci.*, Ser. Biol., No. 5, U.S.S.R., 1940, p. 706. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 272.) Irregularities of development of the cotyledons or of the first foliage leaves, anomalous branching of the axis of the seedling, and such pronounced deformities are not the only ways of recognizing polyploid plants, nor are they infallible signs of polyploidy. Other methods referred to include determining the size of the stomata, in illustration of which tabulated data are given; various exceptions are also mentioned. In using this method it is recommended that the mean dimensions of the stomata on 10 control plants be taken for comparison; that all leaves should be taken at the same stage of development, and examinations be made on the same regions of the leaf, the lower epidermis being preferred to the upper, since it is less liable to be damaged; that both the breadth and length of the guard cells be measured and the area of the stomata be calculated—this gives a much more sensitive index than either the length or breadth alone. Other features of polyploids are the irregular form of the cells adjacent to the stomata, the larger nuclei of the epidermal cells, the larger number of nucleoli, which are often of an unusual form, and the larger pollen. No single one of these criteria is infallible, but when a number are taken together a high degree of certainty may be obtained. The only final criterion is the nature of the progeny.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

242. Cellulosic Materials: Acid Hydrolysis. By R. F. Nickerson. (*Ind. Eng. Chem.*, **33**, 1941, p. 1022. From *J. Text. Inst.*, xxxii., **11**, 1941, A518.) Data on the hydrolysis of linen, cotton, mercerized cotton, wood pulps, viscose and cuprammonium rayons, cellulose acetate and methylcellulose, in boiling 8 per cent. hydrochloric acid are presented and discussed. The method used was based on measurements of the evolution of carbon dioxide from the glucose set free during hydrolysis with the acid. Curves showing percentages of cellulose hydrolyzed with time indicate that, initially, varying amounts of the celluloses are hydrolyzed rapidly to glucose, but that later the residual cellulose becomes more and more resistant to breakdown by acid. The solid still present after refluxing cotton for 7 hours with acid was filtered, washed thoroughly, dried and examined. A photomicrograph revealed that it consisted entirely of broken cotton fibres. X-ray diagrams of this material and of a mat of unhydrolyzed cotton are identical and demonstrate that, under the conditions employed, hydrolysis does not alter the crystalline pattern appreciably. These results indicate that cellulose probably consists almost entirely of chains of anhydroglucose units in varying degrees of association, ranging from a dense, crystalline, acid-resistant fraction to an amorphous, easily-hydrolyzed fraction. Mercerization, dispersion in cuprammonium hydroxide solution, and treatment by the viscose process reduce the quantity of resistant cellulose.

243. Über das Verhalten von Cellulose bei der Druckerhitzung in Alkoholwassermischungen. By T. Kleinert. (*Cellulosechemie*, **18**, 5, 1940, p. 114. From *Cott. Lit.*, December, 1941, p. 511.) Unbleached cotton and cotton linters were heated with alcohol-water mixtures in sealed glass tubes at 180° C. for 4 hours. The cellulosic material emerged from the treatments with mixtures rich in water with a slightly brownish colour, whereas it appeared pure

white after treatment with alcohol alone. Linters heated in water alone became brittle and could be converted into fragments when rubbed between fingers. On the other hand, cotton heated in alcohol and alcohol-water mixtures rich in alcohol retained its original strength properties. Heating with water alone decreased the alpha-cellulose content of cotton to 92·2 per cent. and of cotton linters to 52·6 per cent.; these figures increased as the alcohol portion of the mixture was increased. In pure alcohol almost no attack takes place. Obviously alcohol decreased the hydrolytic effect of the water.

244. Pectic Substances in Cotton. By F. Leger and P. Larose. (*Canad. Jnl. Res.*, **19**, 2, 1941, p. 61. From *Cott. Lit.*, July, 1941, p. 287.) The quantitative distribution of pectic substances in raw cotton has been studied. A new method for the removal of cuticle pectin has been utilized. A combination of this method with analysis for *a*-cellulose has shown that the non-cellulosic material in undamaged cotton appears to be present in the form of pectin. In direct support of recent work carried out by Harris and co-workers . . . and in contrast to that published by Farr . . . it has been found that reduction of pectin content from 1·18 to 0·12 per cent. resulted in a change of fluidity from 1·93 to 2·08, whereas treatment with hydrochloric acid raised the fluidity to 25·8. It is suggested that there is no essential chemical difference between pectin in the cuticle surrounding the fibre and that distributed throughout the fibre.

245. New Technique developed in measuring the Diameter of the Cotton Fibre. By J. H. Moore. (*J. Amer. Soc. Agron.*, **33**, 2, 1941, p. 183. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 282.) Methods used to measure diameter of cotton fibres were modified in efforts to make the work less tedious and more accurate. Mercerized mature fibres are now stained in Congo red before drying and diameters as projected on white paper are measured directly with a celluloid metric rule.

[*Cf.* Abstr. **293**, Vol. XVII. of this Review.]

246. Cotton Fibre: Formation of Cellulose Particles in. By W. K. Farr. (*Rayon Text. Mnthly.*, **22**, 1941, p. 519. From *Summ. Curr. Lit.*, xxi., **23**, 1941, p. 597.) The development of the cotton fibre is discussed and an explanation of the mode of formation of cellulose particles in the living fibre is presented. It is stated that the cellulose-forming plastids in the fibre increase in number by direct division before the synthesis of cellulose begins, and that the first evidence of cellulose formation is in an outer part of the plasma of the small plastids. If the plastid membrane is punctured at this period of ring development, the ring material flows out through the opening in the form of a liquid. From this liquid state it gradually passes through a gel state to that of a solid form, which finally fractures directly to form the cellulose particles. The small plastid, with the first-formed cellulose particles suspended in the plasma, then enlarges and a new cellulose ring, greater in diameter but equal in thickness, is formed by a repetition of the method just described. This ring, in turn, fractures into particles. The plastid again increases in size, and the process is repeated again and again. The mature plastid finally bursts and releases the full-formed cellulose crystallites, surrounded by the plastid plasma, into the protoplasm of the fibre cell. Later, the particles orient end to end in single rows to form fibrils, and, with their associated colloidal material of plastid and protoplasmic origin, are deposited in successive lamellæ to form the "secondary" portion of the cell membrane. It is pointed out that this mechanism of cellulose formation has no apparent points in common with the mechanism of starch formation, and that in cells of the cotton leaf, stem, or boll, where both starch and cellulose

are being formed, the syntheses take place in different plastids in the same cell. Series of photomicrographs showing starch formation and cellulose formation are given.

247. COTTON FIBRE: DEVELOPMENT. By K. Hess. (*Klepzig's Textil-Z.*, **44**, 1941, p. 253. From *Summ. Curr. Lit.*, xxi., **23**, 1941, p. 597.) The early stages in the growth of the cotton fibre are discussed with reference to the pectin and wax contents, the epidermis of the seed (as revealed in polarized light), and places of localized heavy growth (with high negative double refraction, as seen before and after treatment with chloroform). The conclusion is drawn that further improvement in rayon will demand some attempt to simulate the growth of the natural fibre, including the incorporation of materials to secure lack of homogeneity.

248. FIBRE MATURITY IN RELATION TO GROUP LENGTHS OF SOME COTTONS GROWN IN THE PUNJAB. By S. Rajaraman. (*Ind. J. Agr. Sci.*, xi., **2**, 1941, p. 177.) Eleven varieties of cotton grown in the Punjab were analyzed into different length grades with a Balls Sledge sorter, and the fibres in each length grade were tested for maturity. Statistical analysis was applied to eight varieties only, and all of them were improved P-A cottons with medium staple lengths. Of the other three, one was the *desi* cotton, 39 Mollisoni, another a new cross, Jubilee, and the third was P-A 4F, and all of these were much shorter in staple. The analysis showed that for the eight varieties the three maturity terms—percentage of mature fibres (*M*), maturity coefficient (*C*), and maturity index (*MI*)—varied with group length (*l*) in a manner which was described by the three regression equations:

$$M = 75{\cdot}734 - 7{\cdot}681\, l + 0{\cdot}620\, l^2$$
$$C = 0{\cdot}9061 - 0{\cdot}02661\, l + 0{\cdot}002410\, l^2$$
$$MI = 0{\cdot}8342 - 0{\cdot}04834\, l + 0{\cdot}004269\, l^2$$

where *l* is in units of $\frac{1}{8}$ inch. As the group length increases from $\frac{3}{8}$ to $\frac{6}{8}$ inch the mean percentage of mature fibres (and also maturity coefficient and maturity index) decreases, but further increase of group length is accompanied by an increase of the mean maturity terms. This confirms the statement made by Gulati and Ahmad that the correlation coefficient between spinning value and percentage of mature fibres is negative for short-staple cottons and positive for medium- and long-staple cottons.

249. BEHAVIOUR OF COTTON FIBRE WITH AMMONIUM OXALATE AND CUPRAMMONIUM SOLUTION. By E. Heuser and J. W. Green. (*Indus. and Eng. Chem.*, **33**, 7, 1941, p. 868. From *Cott. Lit.*, November, 1941, p. 466.) The conclusions may be drawn that the existence of Farr's cementing material as a fundamental constituent of the cotton fibre is rather improbable, and that the viscosity of a solution of the cotton fibre is a property of the entire fibre and not of a problematical cementing material alone.

250. COTTON FIBRES: FINENESS MEASUREMENTS. By M. A. Grimes. (*Text. Res.*, **11**, 1941, p. 459. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 567.) The fineness of the fibres of each of five cottons has been determined by measurements of the ribbon width of the fibres in their natural state, the width in sodium hydroxide, the width after mercerization without tension, the weight per unit length, and the area of cross-sections. The results are tabulated and discussed. The order of the cottons with respect to fineness is not the same by all methods. The significance of differences between the cottons, and correlation coefficients between area and weight per inch, weights and widths, etc., are discussed. The conclusion is drawn that small differences in fineness may not be determined

with certainty, but that wide differences may be detected by any of the methods used. It is suggested that the choice of method might be made on the basis of the information desired—*i.e.*, whether it is the area the fibre occupies or the quantity of material present in the fibre—and on the relation of each type of fineness to the spinning value.

251. Electrical Insulation Cotton: Production. By C. Seyd. (*Textilberichte*, **22**, 1941, p. 208. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 36.) The electrical conductivity of cotton is ascribed largely to the potassium carbonate naturally present. This can be removed by washing with soft water. If hard water is used, several rinsings are necessary.

252. Der Einfluss der Belichtung Weisser und Gefarbter Vegetabilischer und Animalischer Fasern auf Deren Histologischen Aufbau. By R. Haller. (*Mell. Textilberichte*, **21**, 7, 1940, p. 352. From *Cott. Lit.*, August, 1941, p. 331.) Raw undyed cotton exposed four weeks to intense sunlight no longer gave the characteristic reactions with cuprammonium or copper ethylenediamine; it also showed uneven swelling in sodium hydroxide solution, in contrast to the uniform swelling of non-illuminated samples.

253. Cotton: Primary Sorption of Water. By S. M. Neale and W. A. Stringfellow. (*Trans. Faraday Soc.*, **37**, 1941, p. 525. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 526.) An account is given of investigations of the sorption of water vapour by bleached cotton yarn at pressures below 1 mm. Hg. The experiments cover sorptions up to 1·5 mg./g. It is probable that only primary sorption is involved in this region. The differential heat of sorption is constant over this range at 15·7 k. cal. per g. mole. To account for this value it is suggested that in the stage of primary sorption each water molecule is directly linked to a pair of suitably spaced cellulose OH groups in the non-crystalline region. As the sorption of water by cellulose increases beyond the primary stage, secondary linkages between incoming molecules and others already linked with cellulose OH groups will occur. Some of the oxygen atoms will then engage more than one extra-distant hydrogen atom, and the bond energy will fall, as reflected in the falling heat of adsorption. Finally, towards saturation, incoming water molecules will be able to condense only on already heavily water-covered surfaces, and the thermodynamics of the process will gradually approach those of condensation in bulk. (Latent heat at 20° C. = 10·5 k. cal./mole.)

254. Fumigation of Wet Cotton with Methyl Bromide. By H. A. U. Monro and R. Delisle. (*Sci. Agr.*, **21**, 9, 1941, p. 584. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 788.) In the work reported methyl bromide in a vacuum-dissipated treatment of two hours at a dosage of 2·5 lb. per 1,000 cu. ft. at a temperature of 80° F. was completely toxic to adult granary weevils and European corn-borer larvæ placed in bales of wet cotton. After this treatment the gas was rapidly removed by routine ventilation methods. This treatment involved no hazards to workmen or others in the proximity of the fumigated bales.

255. Cotton Yarns: Breaking Load and Elongation. By H. F. Schiefer and R. S. Cleveland. (*J. Res. Nat. Bur. Stnds.*, **27**, 1941, p. 325. From *Summ. Curr. Lit.*, xxi., **24**, 1941, p. 626.) Results are reported of single-strand tests of the breaking load and elongation of cotton yarns varying in count and spun with four twist factors. Pendulum and inclined-plane types of testing machines and two rates of loading were used. The results give information regarding the corrections of these machines, variability of the yarns, and the number of tests required for a given precision and probability. The effect of rate of loading on the breaking load and elongation is discussed.

256. Cotton Yarns: Moisture Regain. Div. of Tr. Standards, U.S. Nat. Bur. of Standards. (*Rayon Text. Mnthly*, **22**, 1941, p. 448. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 528.) A new regain standard, "Commercial Standard CS 11/41," operative from August 1, 1941, is reproduced. The following are the special features: (1) Dry weight is defined as that reached in an oven at 105°-110° C. when two consecutive weighings taken not less than ten minutes apart do not differ by more than 0·1 per cent. of the first of the two weighings. (2) The commercial moisture regain of unmercerized cotton yarn shall be 7 per cent. (3) The regain for mercerized cotton yarn shall be 8½ per cent. (4) A tolerance of ±1 per cent. is allowed on invoice weights.

257. Moisture Relations of Textile Fibres at Elevated Temperatures. By J. G. Wiegerink. (*J. Res. Nat. Bur. Standards*, U.S., **24**, 6, 1940, p. 645. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 429.) The moisture contents of ten kinds of textile fibres in the form of specially prepared yarns were determined when the fibres were in equilibrium with air for a series of relative humidities and temperatures. Data were obtained for both "desorption" and "adsorption," the yarns being brought to equilibrium from a wet condition and a dry condition respectively. The fibres studied were raw, purified and mercerized cotton; clothing and carpet wool; viscose and cuprammonium rayon; raw and degummed silk; and cellulose acetate. The temperatures ranged from 96° to 302° F., and the relative humidities ranged from 5 to 90 per cent. for temperatures below 212° and up to the maximum obtainable at atmospheric pressure above 212°. The results are given in the form of graphs showing moisture content against relative humidity, and also in the form of graphs in which the logarithms of the moisture contents at given relative humidities are plotted against the reciprocals of the corresponding absolute temperatures. The last show straight-line relationships with changes in the slopes of the lines between 200° and 220°.

258. Cotton Yarn: Partial Acetylation. By Z. A. Rogovin and M. O. Sverdlin. (*Org. Chem. Ind.*, **7**, p. 253, U.S.S.R., 1940. From *J. Text. Inst.*, xxxii., **11**, 1941, A512.) The authors report on the influence of the catalyst and the diluent in the partial acetylation of cotton yarn, and recommend the following procedure: The yarn is scoured with 1 to 2 per cent. caustic soda (open boil) and bleached; time 3 hours, temperature 35° C., ratio of yarn to liquor 1 : 18 or 20; acetylating mixture acetic anhydride 20, acetic acid 80, perchloric acid 0·4 per cent. on the weight of the yarn.

259. Cotton Yarn: Shrinkage. By G. S. Kasbekar. (*Ind. Text. J.*, **52**, 1941, p. 18. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 38.) The effects of solutions of acids, alkalis and salts on the dimensions, appearance, and dyeing and other properties of cotton fibres, yarns and fabrics, and the use of such reagents in mercerizing and finishing processes are briefly discussed. Results obtained in a systematic study of the shrinkage of bleached cotton yarn in zinc chloride, calcium thiocyanate, and sulphuric and phosphoric acid solutions are described. Tables show maximum percentage shrinkage and time for maximum shrinkage in solutions of various concentrations at 25° C. In each case as the concentration of the solution increases the shrinkage of the yarn increases, reaches a maximum, and then begins to decrease. The importance of the time factor in industrial applications is pointed out.

260. The Chemical Processing of Indian Cotton Materials. Pt. I. The Effect of Kier Boiling and Bleaching on the Cuprammonium Fluidity and Strength of Yarns Spun from Four Good Quality Indian Cottons. By N. Ahmad *et al.* (*Tech. Bull.*, Ser. B, No. 29, Ind. Cent. Cott. Comm., 1941.) Four Indian cottons of the 1934-35 season (Jayawant, Cambodia Co. 2, Surat

1027 A.L.F., and P.A.289F) were spun to 24's by identical processes and submitted to a series of kier boils in an experimental kier, the treatments involving the use of caustic soda of various concentrations, of organic solvent emulsions, of wetting agents, and both open and pressure boiling. Yarn kier boiled under one set of conditions was also bleached and soured under standard conditions. The samples were then examined for fluidity in cuprammonium solution and strength. The results indicated *inter alia* that the concentration of caustic soda in a pressure boil is not a significant factor so far as the degradation of the cotton is concerned. On the other hand, an open boil with soap and soda ash gave consistently high fluidity values and low tensile strength. The effects on fluidity and on strength did not, however, always run parallel. Considering the treatments from the point of view of the cottons, Cambodia exhibited the least and 289F the highest degree of degradation as indicated both by the fluidity and the strength. The fluidities of the bleached samples were in all cases significantly higher than those of the unbleached samples, but the strength tests did not disclose a similar effect.

261. The Breaking Strength of Fabrics. By P. Larose. (*J. Text. Inst.*, xxxii., **9**, 1941, T167.) Two types of tests are widely used for determining the breaking strength of fabrics—the "strip" test and the "grab" test. The former method is generally recognized as giving the more reliable and accurate results, but the latter is faster and easier to carry out. The purpose of this paper is "to present additional results in regard to the relation between the grab test and strip test results and to propose a new method possessing the advantages of the strip and grab methods."

262. "Short-Cut" Cotton Spinning Preparation. (*Text. Manufr.*, October, 1941, p. 326.) Brief notes are given of the following systems of shortened cotton-spinning processes which are successful with due precautions under suitable conditions: *Graduated-draft speed frames*, omitting one speed-frame process; *high-draft speed frames*, omitting slubbing and intermediate frames; *lap draw-frame system*, reducing the draw-frame processes to one; *half-weight sliver system*, in which the sliver from the third head of drawing is divided into two groups and the half-slivers put up at the intermediate or high-draft speed frames.

263. Irrigated Cotton: Spinning Quality. Southern Text. Assen. (*Cotton*, U.S., **105**, 1941, No. 11, p. 77. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 59.) In the course of a general discussion on spinning and weaving problems it is reported that irrigated cotton gives trouble in carding and combing and may give rise to dyeing defects if mixed with rain-grown Delta cotton.

264. Relative Yarn Strengths using Casablancas and Three-Line Draft Systems at the Speed Frames. By H. A. Hancock and F. Dunkerley. (*J. Text. Inst.*, xxxii., **9**, 1941, T193.) Spinning-test results, using ordinary draft systems at the speed frames, with rollers reset for each cotton, are compared against tests using Casablancas apron system at the speed frames, working at a fixed setting for all Egyptian cottons. The ranking order of samples is found to be closely similar whichever draft system is used, to the advantage of the apron system because its testing technique is faster. A small displacement of values is noticed with combed staples processed by the apron system, an effect ascribed chiefly to the higher regularity of combed cotton; but the effect is of negligible importance over the range of staple irregularity found in Egyptian raw cottons.

265. Roller Settings and Yarn Strengths. By F. Dunkerley. (*J. Text. Inst.*, xxxii., **9**, 1941, T179.) The experimental evidence presented in this paper

is drawn from the results of over 1,000 spinning tests, conducted equally on 18 different types of Egyptian cottons, and from the breaking of more than 20,000 leas. The objects were: (i) To find out the effects on resulting yarn strengths of changes in roller settings at slubber, intermediate, rover, and ring frames separately; (ii) the settings for maximum strength having been ascertained, to find out how these maximum settings could be related to staple length; (iii) comparing Casablancas apron systems with three-line and light-middle-top-roller systems, using the same drafts and speeds for both, to find out by how much did these roller systems differ in sensitivity to changes in roller settings distances.

The results obtained may be stated as follows: (*a*) Small changes in roller settings have little effect on yarn strength, especially when roller settings are made wider than the optimum, but if errors in settings are made at each stage, the cumulative effect may be quite appreciable. (*b*) Staple length as normally understood can be used as a guide to roller settings on the speed frames three-line roller systems. In the experiments here recorded, little loss in resulting yarn strength was found when the slubber and intermediate, using weighted three-line roller systems, had settings such that the distance between front and middle lines roller nips was equal to staple length plus 4/32 inch; the equivalent setting for the rover, using a self-weighted three-line roller system, was equal to staple length minus 2/32 inch. (*c*) The difference in sensitivity at each stage was found to be slight when considering settings up to 1/8 inch wider than the optimum, but the weighted three-line systems on slubber and intermediate showed serious losses in resulting yarn strengths for the weaker samples when the settings were very close; the fall in strength at close settings was absent from the Casablancas systems. In this sense, the weighted three-line systems were more sensitive to changes in roller setting distances than were the corresponding Casablancas systems.

[*Cf.* Abstr. **748**, Vol. XIV. of this Review.]

266. Statistical Methods in Textile Research. The Design of Weaving Experiments. By V. R. Main and L. H. C. Tippett. (*J. Text. Inst.*, xxxii., **11**, 1941, T209.) Experiments have been conducted at the Shirley Institute for many years to measure the effects on warp breaks in weaving of conditions of the yarn preparation and loom settings, and attention has been paid in designing the experimental lay-out to reducing errors as far as possible and to measuring them, so that the statistical significance of the results can be tested. This paper gives a general account of the importance of the errors arising from various sources and discusses the most economical arrangement for various types of experiment. The designs and methods are similar to those originally developed for use in agricultural field trials. Most of the experiments have involved measuring differences in breakage rates between warps, which, during the experiment, are interchanged between looms to give a Latin square. A typical experiment is first described and analyzed in detail to show the various sources of error and introduce the variances that measure their effects. The next section summarizes the results of similar analyses for many experiments. In the final section the general question of the design of weaving experiments is discussed in the light of the results of the previous section. The conclusion is reached that a randomized block design to eliminate loom and associated variations is better than the Latin square design, and that for some kinds of experiments a " split-plot " design can be adopted with advantage. The error variance is a composite quantity made up of the effects of variations within pieces to which are added the effects of variations between pieces, and because of this there is an optimum piece-length which gives maximum precision for minimum cost;

this length is worked out to be 60 yards. There follows a discussion of the use of a transformation of the breakage rate results to make the error variance independent of the mean; owing to difficulties in the interpretation of results expressed in terms of the transformed variable, it is deemed inadvisable to use such a transformation. Finally, it is shown how interactions between various factors affect the generality of the results of an experiment, and how account should be taken of this in deciding the scale of replication. The main conclusion reached is that all experiments should be replicated as many times as possible.

267. Cotton Mill: Cleaning. Southern Text. Assen. (*Cotton*, U.S., **105**, No. 11, 1941, p. 72. From *Summ. Curr. Lit.*, xxii., **8**, 1942, p. 59.) The cleaning of blowing and spinning rooms and machines, tape frames, and weaving sheds is discussed, and the practice followed in several American mills is reported by managers. Considerations of safety are emphasized.

268. Cotton Pulps: Influence of Cuprammonium Viscosity on Beating. By D. M. Musser and H. C. Engel. (*Paper Tr. J.*, **113**, 1941, Tappi, 13-16. From *J. Text. Inst.*, xxxii., **10**, 1941, A485.) The use of cotton for paper-making is discussed and an account is given of investigations of the practicability of decreasing the beating time of cotton pulps by reducing their cuprammonium viscosities. Pulps were prepared from (1) American lint of 15/32 inch staple length, (2) second-cut linters, and (3) cottonseed hull fibres. The cooked fibres were bleached with hypochlorite solution at *p*H8 and the amount of chlorine was varied to give different pulp viscosities. Test sheets were prepared and their physical properties measured. Studies were made over a beating range sufficient to establish for a given viscosity the maximum tear factor, burst factor, and breaking length. Curves showing changes in properties with beating time and the relations between cuprammonium viscosity and hours of beating required to produce the highest tear factor, burst factor, and breaking length respectively are given. The curves show that the beating time required can be reduced by lowering the specific viscosities of the pulps to values below 10. In the less degraded state—*e.g.*, at specific viscosities of 20—and under identical conditions the lint pulps required more beating than the linters pulps and the latter more than the hull-fibre pulps, but the differences became smaller as the viscosities were reduced. The physical properties of paper made from the lint fibres are superior to those of paper made from linters and from hull fibres. Reducing the specific viscosity below 10 causes a decline in the quality of the paper produced, but the use of this method of reducing beating time requirements is feasible in the case of pulps made from cotton lint.

269. Cottonseed Hulls: Use in Phenolic Plastics. By F. Rosenthal. (*Ind. Eng. Chem.*, **33**, 1941, p. 980. From *J. Text. Inst.*, xxxii., **11**, 1941, A535.) Cottonseed hulls are a heterogeneous mixture of hull bran and fibre. The absorbing power of the hulls is a function of their particle size and fibre content. In a study of the suitability of such materials for use as fillers for phenolic moulding compounds hull bran samples were prepared of controlled particle sizes of 40, 60, 100, 150, 200, and finer than 200-mesh screen respectively, and moulding compounds were made by impregnating each of the samples with the same amount of identical phenolic resin. Compounds were also prepared from bran of various particle sizes containing 5, 10, 15 and 20 per cent. hull fibre respectively. Tests were made for impact strength, modulus of rupture, and modulus of elasticity. A maximum impact strength was obtained when the cottonseed hull filler had a particle size of 100 mesh and 10 per cent. fibre content. A maximum modulus of rupture was obtained with cottonseed hulls of 60 mesh and no fibre content. The modulus of elasticity seemed to vary in proportion

to the modulus of rupture. By controlling the particle size and fibre content it is possible to prepare phenolic cottonseed hull moulding compounds comparing favourably in strength characteristics with commercial phenolic compounds.

TRADE, PRICES, NEW USES, ETC.

270. Round the World with Cotton. By I. W. Duggan and P. W. Chapman. (*U.S. Dpt. Agr., Agr. Adjust. Admin., S. Div.*, 1941. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 680.) This publication presents "in simple, non-technical style a story of cotton at home and abroad. It uses easily understood words, photographs and charts to tell in entertaining fashion what has happened to cotton since its legendary origin in India 5,000 years ago."

271. World Cotton Supplies: Prospects. By Sir Homi Mehta. (*Ind. Text. J.*, **51**, 1941, p. 269. From *Summ. Curr. Lit.*, xxi., **24**, 1941, p. 614.) Progress in cotton production in America and in other countries is reviewed, past dependence on the United States is pointed out, and the lessening of this as a result of the great increase in outside growths in the last decade or two is noted. It is pointed out that future prospects will depend on price trend, the policy of the United States Government, the trend of international politics, and competition of other fibres. Conditions after the war are considered, and the hope is expressed that the inflation and subsequent depression experienced after the last war will be avoided.

272. Cotton Statistics. By J. A. Todd. (*Text. Manufr.*, lxvii., 1941, No. 802 and subsequent issues.) The twenty-fourth paper of this series (October) discusses the prospects of the American cotton crop and also the Indian crop for the present season. Tables are included giving Cotton Prices in New York and Bombay weekly from April 5, 1941; Supply and Distribution of American Cotton annually from 1929-30; U.S. Cotton Consumption by Varieties monthly from August, 1939; Area, Yield, and Price of the Indian Cotton Crop for Five-Year Periods from 1914-15 to 1939-40, and annually from that season. Figures of the World's Cotton Crops are also given for the same periods.

The next paper (November) deals with the following: American Exports; Empire Cotton Crops; South American Crops. Three tables are included giving the Season's History of the American Crop; Prices of Spot Cotton in Great Britain; Empire Cotton Crops for 1914-15, 1924-25, and 1929-30 onwards.

In the following article (December) the American cotton situation, the situation in India, and the prospects for cotton in South America are discussed, and four tables are included on the Supply and Distribution of all cotton in the U.S.A. from 1918-19 to 1940-41; Monthly Consumption of all cottons in the U.S.A. from August, 1938-39, to October, 1941-42; Government controlled Stocks in U.S.A. in 1941; Cotton Prices in New York and Bombay weekly from August 2 to November 22, 1941.

The prospects for production and consumption in 1941-42 are discussed in the next paper (January, 1942), and in the author's view the economic consequences of the world-wide war conflagration are: (1) Accumulating surpluses of raw cotton in most cotton-producing countries; (2) a further contraction in maritime commercial intercourse; and (3) progressive growth of an enormous potential demand for cotton textiles over the greater part of the world. The following tables are included: United Kingdom Exports of Cotton Yarns and the Board of Trade (Volume) Exports of Piece Goods quarterly from 1932 onwards; Season's History of the American Crop annually from 1935-36; Production of Commercial Cotton in the World (Garside's estimates) from 1938-39 onwards.

The next article (February) discusses far-reaching changes in the raw cotton section of the industry in this country, the situation in the United States, Egypt, and India, and the outlook in the South American States. A table is included showing Cotton Prices in New York and Bombay weekly from September 6, 1941, to January 24, 1942.

The article for March discusses the raw cotton position in Lancashire, United States developments, cotton in India, cotton legislation in Egypt, and the cotton position in the South American States. A table is included of the monthly consumption of cotton in the United States for the six months from August to January, 1939-40, 1940-41, and 1941-42.

273. Post-War Lancashire Cotton Industry. By T. Driver. (*Text. Manufr.*, January, 1942, p. 6.) Deals with the problems of post-war reconstruction and the possibility of re-equipment of cotton spinning mills, and organization of the industry and export trade.

274. Uses for Cotton. By D. M. Ellis. (*U.S. Dpt. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 91, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 835.) A bibliography of 785 selected references in English, classified according to specific uses of cotton.

275. New Uses for Cotton Pulp. By F. C. Vilbrandt. (*Chron. Bot.*, vi., **5**, 1940, p. 97. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 293.) A brief record of the volume and nature of cotton consumption by pulp industries, a summary of researches on chemical pulp, and a bibliography relating to cotton processing.

REVIEW

276. Agriculture in the West Indies. ("Colonial No. 182," H.M. Stat. Office, 1942. Price 10s. net.) This publication, issued on behalf of the Colonial Office in relation to Colonial Development and Welfare in the West Indies, is compiled mainly from documents supplied to the West India Royal Commission, 1938-39, supplemented with material from recently published reports, and deals with the British colonies in or near the Caribbean region, including British Guiana and British Honduras. An introductory chapter supplies the local historical background, but does not, as would have been instructive, correlate this with the development of tropical agriculture in other parts of the world. This is followed, colony by colony, with a survey of agricultural conditions, an account of the various crop industries with recent statistics of production, and a description of existing agencies for agricultural organization.

The general picture which emerges is of an economy still based on a centuries-old tradition of production for export, balanced not only by the importation of manufactures, including almost the whole supply of timber, but of a large proportion of the food consumed. Agriculture was developed on the plantation system, first with slave and later with wage labour, and where, as happened during periods of depression, estates were broken up into small holdings, or where these were formed from Crown lands, the almost universal tendency has been for the peasant to follow the estate tradition and grow sugar-cane, or cacao, or bananas, or limes, or cotton for the existing export markets. The decline of values due to increasing competition or changing demand and the decline of productiveness due to soil depletion and plant diseases have made dependence on these industries precarious, and the economic situation has been greatly aggravated since the previous steady flow of emigration was arrested, with a consequent rapid increase of local population. The needed remedy, as seen by the Royal Commission, is more intensive use of the land with increased production of food, coupled with the development of peasant agriculture.

That intensive cultivation, the fuller use of land, and the increase of peasant holdings will not in themselves suffice is shown by the example of Barbados, where cultivation is admittedly intensive and complete. This has resulted in the development of a dense population particularly dependent on imported food and fuel, and this is true in degree of peasant as well as planter. So far as an export economy on the old lines cannot meet the present or future situation the need will impose itself to make food production a first charge on the land, and cash crops an adjunct when this has been satisfied.

Of the cash crops introduced as alternatives or supplements to sugar-cane the most successful, over the period beginning with the present century, has been Sea Island cotton. About two-thirds of the crop is produced in the Leeward Islands: Montserrat, St. Kitts-Nevis, Antigua, Anguilla, and the Virgin Islands; the remaining third, of specially high grade, in St. Vincent. The St. Kitts crop is grown as a catch crop on sugar estates; elsewhere small-holders predominate, though there is a considerable amount of estate cultivation in Montserrat and St. Vincent. In Barbados, where both estate and peasant cultivation flourished in the early part of the period, the industry has now fallen to very small proportions.

The West Indian Sea Island Cotton Association was formed in 1933 to promote and protect the industry and to develop demand for the product, and is maintained by an export cess on cotton lint. The Association estimates annually the capacity of the market to absorb supplies during the coming season, and by advising the Governments concerned, secures the limitation of acreage to the appropriate extent.

Two general chapters of the publication deal with agricultural education and with intra-colonial agricultural organizations. Under education an account is given of the Imperial College of Tropical Agriculture in Trinidad, and of its functions in providing instruction and conducting research. The courses which have special local application are the three-year diploma courses in West Indian agriculture and sugar technology respectively. Outstanding research activities are the Cacao Research Scheme, the Low Temperature Research on the storage and transport of fruit and vegetables, the investigations of the Chemical Department on tropical soils, and of the Department of Sugar Technology on improvement in sugar manufacture. (Another activity which deserves specific mention is the pioneer work on banana breeding.)

The Farm School in Jamaica supplies working instruction over a wide range of agricultural practice, and has been in existence for twenty-six years. A system of agricultural apprenticeship in the work of Government experiment stations and nurseries, once more general, persists in three colonies. Agricultural science is included in the subjects taught in secondary schools, and two modern secondary schools with an agricultural bias have been started in Jamaica.

In addition to the Cotton Association already noticed, the following agricultural organizations have been established: a Sugar-Cane Breeding Station in Barbados, a West Indies Plant Quarantine Committee which maintains a Quarantine Station at the Imperial College in Trinidad, and Fruit and Vegetable Councils for the eastern and western groups of colonies, formed with the object of co-ordinating production and export.

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EMPIRE COTTON GROWING REVIEW
ABSTRACT NUMBER

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

277. SECOND CONFERENCE ON COTTON GROWING PROBLEMS IN INDIA, JANUARY, 1941. (*Rpt. and Summ. of Proc.* Published by Ind. Cent. Cott. Comm., Bombay, 1941. Price Rs. 2-8-0, Foreign 4s.) The Conference was open to all members of the Indian Central Cotton Committee and cotton research workers in India, including those of the Agricultural Departments. Abstracts only of the longer papers and the full text of the shorter ones, with a report of the discussions, are recorded. Some of the papers presented have already been noted in this Review. Others are dealt with under their respective sections in the present number.

278. THE INDIAN CENTRAL COTTON COMMITTEE AND ITS WORK. By D. N. Mahta. (Ind. Cent. Cott. Comm., Bombay, 1942.) We have received a copy of this useful pamphlet discussing briefly the constitution and aims of the Committee and what it has accomplished during the twenty-one years it has functioned. During this period valuable work has been carried out in connection with the breeding and cultivation of better varieties of cotton, improvement of marketing conditions, publication of more accurate cotton forecasts and of statistics of importance to the grower and the trade, and the enactment of legislation for the improvement of cotton transport, ginning, and baling. Brief summaries are also included of the work of the Technological Laboratory, Bombay, the Institute of Plant Industry, Indore, and of the research work on cotton in Bengal, Bombay, Central Provinces, Madras, Mysore, Punjab United Provinces, etc.

279. INDIAN CENTRAL COTTON COMMITTEE. (*Ann. Rpt. to August* 31, 1941.) Continued progress is recorded in the work of the Committee throughout the year. Thirty-four research schemes and 18 seed extension schemes financed by the Committee were in operation. At the Technological Laboratory, Matunga, 1,800 samples were tested, compared with 768 in the previous season, and 1,046 reports on these samples were issued. A number of technological investigations were also in progress in connection with the pre-cleaning and ginning of Indian seed cotton on different machines and with different settings and speeds, the effect of different treatments in the blow-room, effect of storage under Bombay conditions on the quality of Indian cottons, the influence of swollen hair diameter on the spinning quality of cotton, etc. Good progress was made in the important

work carried out at the Institute of Plant Industry, Indore, on cotton genetics, physiology, selection and breeding, varietal trials, and seed multiplication and extension. The various Acts passed for the regulation of transport, marketing, ginning and pressing of cotton and the prevention of the introduction of foreign pests, continued to function satisfactorily during the period under review. Progress was also made in the investigations in connection with the following pests and diseases: spotted bollworm, jassid, black-headed cricket, cotton stem weevil, pink bollworm, and root-rot and wilt diseases.

280. INDIAN CENTRAL COTTON COMMITTEE. The report of the forty-fourth meeting of the Committee held in Bombay on July 18 and 19, 1941, has recently been received, and contains summaries of the final or progress reports of the many research schemes financed by the Committee. These include schemes in connection with cotton breeding, seed distribution and extension, marketing, ginning and pressing, control of pests and diseases, and recommendations for new research. The valuable work carried out during the 1940-41 season at the Technological Research Laboratory, Bombay, was also reviewed.

281. INDIAN COTTON: STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3, and 4, 1940-41, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1941; receipts at mills in India of raw cotton classified by varieties, 1940-41 season; exports by sea of Indian raw cotton classified by varieties, 1940-41 season.

282. THE NEED FOR MORE INTENSIVE PROGRAMMES IN HYBRIDIZATION OF COTTONS IN INDIA. By V. Ramanatha Ayyar. (Combatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 18.) Selection had not, in India, produced sufficiently encouraging improvements in the past, due either to faulty technique or the absence of variability. This paper emphasizes the need for undertaking hybridization in addition to selection. Past failures are analysed and desirable methods indicated. In practice these appear to involve an immense amount of work, but the prospect should be resolutely faced.

283. THE EFFECT OF STORAGE, UNDER CERTAIN SPECIFIED CONDITIONS, ON THE QUALITY OF INDIAN COTTONS. By N. Ahmad and A. N. Gulati. (Tech Lab., Bombay.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 137.) Storage for 2½ years in the bale produced distinct signs of deterioration in quality. Watering cotton always results in loss of strength and shade. Loss of strength increases rapidly with the humidity of the atmosphere in which the cotton is stored. The evil effects of adding water before pressing are clearly shown. These can be avoided by a small addition of formalin, but the authors strongly deprecate watering in any form.

284. SPINNING TEST REPORTS ON INDIAN COTTONS, 1940-42. By N. Ahmad. (*Tech. Circs.*, Nos. 465-71, 477-8, 482-4, 486-8, 490-2, 494, 499-502. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for Gaoram 6, Khandesh, LSS, Broach, Jayawant, Upland, Navsari, Farm Westerns, Kadi-Viramgam, Bijapur, Berar, C.P. No. 1, and Punjab-American 4F cottons; the grader's report and spinning test results for Farm Westerns, Miraj, Hubli Kumpta, Hubli Upland, Westerns, Broach, Bailhongal, Cambodia, Karunganni, and Jagadia cottons; the report of the Special Appeal Committee for African cottons and spinning test results for A.R. Kampala, A.R. Busoga, and A.R. Jinja cottons.

285. A REVIEW OF THE POSITION REGARDING RELATION OF FIBRE PROPERTIES TO SPINNING PERFORMANCE OF INDIAN COTTONS. By N. Ahmad. (Bombay.)

(*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 141.) Investigation has revealed the fibre properties which exercise the greatest influence in determining spinning quality. There is, however, a certain percentage of "abnormal" cottons whose actual performance is much above or below the value predicted from their fibre qualities. Their study has indicated the desirability of dividing Indian cottons into four groups, each with certain characteristic fibre properties in common. This enables closer agreement to be reached

286. Spinning Quality of Khandesh Cotton Strains when Grown in Different Types of Soil. By T. R. Khadilkar. (Jalgoan.) Environment and Quality of Cotton. By K. Ramiah and V. G. Panse. (Indore.) Variations in the Measurable Characters of Cotton Fibres. IV. Variations Caused by Change of Place and Season. By R. L. N. Ivengar. (Coimbatore.) Effect of Climatic Conditions, Rainfall, Soil and Locality on the Fibre Properties, Ginning Percentages and Yields of Jayawant Cotton. By H. R. Nayak. (Dharwar.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, pp. 143 *et seq.*) These four papers give accounts of investigations in their respective areas into the relations between climatic and soil differences and the ensuing variations in the crop, especially in the quality of the cotton. Fibre length, lint weight, and ginning percentage are notably affected.

287. Technological Reports on Indian Cottons, 1940-42. By N. Ahmad. (*Techn. Circs.*, Nos. 475-6, 479-81, 485-9, 493, 495-8. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Verum 262 (*Nagpur*). -Samples showed considerable falling-off in 1940-41. Yarns generally slightly neppy. Suitable for 24's warp.

Late Verum (*Nagpur*).—This cotton gave its lowest performance in 1940-41. Yarns somewhat neppy. Suitable for 24's warp

289*F*/*K*25. Yarns slightly neppy. Suitable for 28's warp.

Cambodia Co.2 (*Cambodia* 440). Yarns slightly neppy, but show distinct improvement since 1934-35. Suitable for 28's warp.

Gaorani 6. In 1940-41 yarns practically free of neps. Suitable for 32's warp.

Jayawant (*Kumpta*). Yarns distinctly less neppy during the past five seasons. Suitable for 41's warp.

Sind Sudhar (289*F* 1). Yarns somewhat neppy. Suitable for 46's warp.

Punjab-American 4F. Yarns distinctly neppy. Suitable for 24's warp.

Jarila.- Yarns less neppy. Suitable for 24's warp in 1941-42, compared with 34's in 1940-41, indicating a appreciable decline in spinning performance.

Umri Bani. Cotton would gain by being picked in a cleaner condition. Yarns less neppy. Suitable for 31's warp.

Late Verum (*Nagpur*). Yarns less neppy in 1941-42. Suitable for 28's warp.

V. 434 (*Akola*). Yarns practically free of neps. Suitable for 26's warp.

288. Technological Reports on Standard Indian Cottons, 1941. By N. Ahmad. (*Tech. Bull. Ser. A, No.* 54, 1941. Ind. Cent. Cott. Comm.) As in former years, the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the twenty-two varieties tested. Only one cotton showed a definite improvement over last year, ten gave practically the same performance, while others showed a falling-off. Improvement was most marked in the Bombay cotton Jarila, and less so in Jayawant, 1027 ALF, Wagad 8, P.A. 289F, P.A. 4F, Koilpatti 1, Karungani C.7, Nandyal 14, N.R., and Umri Bani. The falling off was most marked in Molhsoni and Hagari 1.

289. Technological Reports on Trade Varieties of Indian Cottons, 1941. By N. Ahmad. (*Tech. Bull. Ser. A, No.* 53, 1941. Ind. Cent. Cott. Comm.)

The valuation reports of the Standards Committee and of the Special Appeal Committee and spinning test results for the 1940-41 season are given for 21 varieties of cotton supplied by the East India Cotton Association, and the mill valuation reports and spinning test results for seven cottons supplied by the Bombay Millowners' Association, and two by the Southern India Millowners' Association.

290. The Handloom Industry. (*Cotton*, M/c, 11/4/42, p. 5.) The sharp rise in yarn prices is causing considerable distress to handloom weavers in India, who are said to have been unable to raise the prices of their products to a proportionate extent. The position has been made more acute by a serious shortage of mill yarn in certain weaving centres. Government hope that mills will put forth their maximum effort to expand the output of cotton yarn. As a further measure to increase the supply of yarn in the domestic market Government have decided to restrict forthwith exports of yarn to their pre-war normal. They are also considering the suggestion of instituting an all-India control over the distribution of yarn for a satisfactory solution of the problem of yarn supply to handloom weavers and to meet war requirements. A recent meeting of the Textile Advisory Council held at New Delhi considered, among other things, ways and means of making yarn available to handloom weavers at reasonable prices.

291. Jarila Cotton. (*Cotton*, M/c, 1/8/42, p. 6.) The improved strain Banilla was first evolved for the Khandesh tract under a breeding scheme financed by the Indian Central Cotton Committee, but as its spinning qualities showed deterioration further breeding work was continued and resulted in the production of the wilt-resistant Jarila cotton, which has a medium staple and a spinning capacity up to 24's counts, against 10's to 12's of the local mixture. The area under Jarila in the Khandesh tract in 1940-41 was estimated at 200,000 acres, and the strain is also spreading rapidly in certain areas in Berar. The combined effect of the introduction of the improved varieties Verum, Buri, and Jarila has resulted in the last two or three seasons in a rapid rise in the proportion of medium staple cottons in the Central Provinces and Berar; they now occupy some 30-33 per cent. of the total cotton area in the Province.

292. Indian Textiles: Design. By A. Leix. (*Ciba Rev.*, **36**, 1942, p. 1301. From *Summ. Curr. Lit.*, xxii, 14, 1942, p. 322.) An illustrated account is given of native Indian textiles of the nineteenth and twentieth centuries, their manufacture and their patterns.

293. Report of the Imperial Council of Agricultural Research, 1940-41. (Pubd. by Manager of Publications, Delhi, 1942. Price Rs. 2-12 or 4s. 6d.) An account of the work of the year in connection with agricultural research on various crops, animal husbandry, soil problems, pest control, sugar industry, etc. Cotton is not included.

294. Agriculture and Animal Husbandry in India, 1938-39. (Pubd. by Manager of Pubns., Delhi, 1941. Price Rs. 6 or 9s. 6d.) This report, which has recently been received, deals with agricultural conditions in India during 1938-39; economic work on crops; developments in tobacco production and marketing; composts and composting; research in crop production; agricultural marketing and engineering; animal industry; veterinary research; agricultural education; the co-operative movement as affecting agriculture, etc. The research schemes financed by the Indian Central Cotton Committee, and the work of the Technological Laboratory, Bombay, and of the Institute of Plant Industry, Indore, are reviewed.

295. Geographical Races of *G. arboreum*. By V. N. Paranjpe. (Bengal.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 70.) Types of cotton belonging

to *G. arboreum* var. *cernuum* and *G. arboreum* var. *neglectum* forma *bengalensis* are met with in hill tracts of Assam and Bengal. The extreme isolation of races and places has restricted the various types to small areas in different sections of hills. Manipur State, alone, produces a type which probably belongs to the *Indicum* group, a very early, broad-lobed, yellow-flowered plant with smooth long lint.

296. Bombay Cotton Annual, 1940-41. No. 22. (East India Cotton Assen. Ltd., Bombay. Price Rs. 1-8-0.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section contains the Twentieth Annual Report of the Directors of the East India Cotton Association for the season 1940-41. This is followed by numerous statistical tables of acreage, production, exports, imports, prices, stocks, consumption, Government notifications, etc. An account is also included of the progress made in the introduction of improved varieties of cotton. The publication should prove invaluable to all those who are interested in the production, distribution and consumption of Indian and foreign cottons, yarn and cloth.

297. Bombay. Textile Labour. (*Text. Manufr.*, lxviii., 809, 1942, p. 196.) The final report of the Bombay Textile Labour Enquiry Committee, issued in 1941, makes the following among other recommendations for the improvement of the Indian cotton mill industry: An increase in wages in order to maintain a minimum standard of living; improvement in working hours and the prohibition of night work in certain sections of the industry; rationalization to increase the productive capacity of the industry and raise the standard of living of the workers; previous to rationalization measures to be taken to ensure the use of better quality cotton and good mixing, the maintenance of machinery in good working order, and the provision of adequate lighting and ventilation; improvement of the organization of export markets; the establishment of a national tripartite industrial council for technological and economic research; the regulation of output and prices. Welfare recommendations include the establishment of an institute for research on industrial hygiene and industrial psychology; provision of canteens, dining rooms, rest places, etc.; facilities for recreation; appointment of women welfare officers where large numbers of women are employed; distribution of free milk in crèches in the mills supervised by doctors appointed by the mills; installation of air-conditioning plants and apparatus for dust removal from card rooms; establishment of dispensaries in mills under qualified doctors; and regular inspection of factories. The need is stressed for better housing conditions for workers, and the Committee favours legislation for the regulation of money-lending. Other recommendations made include the introduction of a system of gratuities after about 15 years' qualifying service, and the establishment, where possible, of provident funds open to all classes of employees; compulsory contributory sickness and unemployment insurance schemes; establishment of employment exchanges in large industrial centres; the extension of training facilities, and the setting up of labour courts for dealing with cases of dismissal.

298. Bombay: 8-1 Cotton for Surat. By B. S. Patel. (*Ind. Frmg.*, March, 1942, p. 151.) The Agricultural Department has evolved a strain called Seg. 8-1, by crossing 1027 ALF and Selection 1-A cottons, which combines the good qualities of both parents and is wilt-resistant. With a view to replacing both 1027 ALF and Selection 1-A (which are susceptible to wilt) as soon as possible, all the available seed of Seg. 8-1 has been grown on about 60 acres this year, and if results are successful the seed will be planted on 1,000 acres next year. It is hoped to cover the whole Surat tract with this strain within four or five years.

299. A Review of Cotton Breeding Work in Gujarat. By G. P. Patel. (Surat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 48.) Apart from two areas which grow varieties of *G. arboreum*, Gujarat is all under *G. herbaceum* var. *frutescens*, Delile, the principal varieties being Surtee-Broach, Goghari and Wagad. The steps taken to isolate and improve types of superior merit are reviewed. Recent importations have been made of *herbaceums* from Russia and Iran to form additibnal sources of variability.

300. Central India: Growing of Mixtures. By K. Ramiah and V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 92.) In Central India the components of the mixed Malvi cotton—namely, Upland and *desi*—remain in stable equilibrium, although Upland grown alone gives a very poor performance. Experiments in which the components were grown separately and mixed in different proportions have given results which show that mixtures suffer less from diseases than pure strains, give equally good or better yields, and show an improved spinning quality.

301. Hyderabad: Effect of Growing Mixtures of Pure Strains of Cotton on Crop Yields. By K. Sawnhey and D. V. Narayanayya. (Parbhani.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 93.) The commercial crop of Umri Bani grown in Hyderabad State is a mixture of two species in the proportion 4 to 1, and the components themselves are made up of very mixed types. Nevertheless Umri Bani has given a fairly uniform spinning performance over several years. It appears that the crop in the field forms a more or less balanced population. This suggested the study of the behaviour of mixtures of pure breeding strains. The results of four years' investigation, carried out on randomized replicated plots, are discussed. Generally speaking, it was found that the percentage of crop matured, the ginning outturn and the fibre properties were intermediate between those of the pure strains and more or less proportionate to the percentage of occurrence of the pure strains in the plant population. The sole justification for adopting the practice of growing mixtures in preference to pure strains is their ability to give uniformly good yields year after year. The strains composing the mixture should be either closely allied strains of a variety, or, in the alternative, belong to different species which do not cross freely. Seed renewal will not necessarily be required any oftener than in the case of pure strains. Seed for planting must be taken from the entire produce and not from one picking.

302. Indore: Relation between Quality and Return per Acre in Cotton. V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 84.) Return per acre is an integration of two components: the premium obtainable for quality and the yield of lint per acre. Opportunity was taken to study the question in Malwa by comparing the local Malvi cotton, the improved strain Malvi 9, and Cambodia, a superior Upland type introduced over twenty years back. Over an 8-year period the price of Cambodia was 10·46 per cent. higher than local and 5·94 per cent. higher than Malvi 9. This premium corresponds to a 125 and 50 per cent. improvement in spinning quality respectively. It was found that cultivation of Cambodia would not be profitable if its yield fell 10 per cent. below that of the local *desi* cotton or 6 per cent. below that of the improved strain. Analysis of yield figures shows that the yield of Cambodia is so much below this limit that its cultivation would be distinctly less profitable than that of the two *desi* varieties.

303. Madras: Cotton Cultivation, 1939-40. (Ann. Rpts. of various Stations, 1939-40, received 1942.) At Coimbatore the continuous rainfall during the early stages and the prolonged drought during the growing and maturing periods

affected the cotton crop adversely, and the actual yields proved disappointing. The work on cotton was mainly concerned with the improvement in quality and yield of the Coimbatore and Salems varieties. At the Hagari Station yields of H.1, though above normal, were lower than last season owing to damage caused by field rats. Crossing of this cotton with other strains is being carried out with a view to improving the yield, staple length, and ginning percentage. Growth of cotton at Koilpatti Station was poor owing to adverse weather conditions, and yields were below normal. In yield trials K.1 maintained its superiority over 18 other strains (12 from the Cotton Specialist, Coimbatore, 5 from the purity tests, and 1 from the Physiological Botanist). In comparative yield trials at Nandyal Station the strain 3002 gave 547 lb. kapas per acre compared with 417 lb. per acre for the control N.14. In district trials to study the performance of strains in tracts outside the Station, Local and N.23 cottons gave higher yields than N.14.

304. Mixed Cropping in India. By G. N. R. Ayyangar. (*Ind. Frmg.*, May, 1942, p. 255.) Experiments were conducted at the Agricultural Stations (Madras) in the cotton-growing areas to determine what crops could be grown as mixtures with cotton. At the Guntur Station a mixed crop of cotton and groundnuts proved more successful than cotton with either Italian millet or rice, and cotton alone. At Nandyal Station cotton and horsegram (*Dolichos biflorus*) gave yields similar to cotton alone, and the residual effect of horsegram in the mixed crop was non-existent or negligible. The only advantage was the produce from the horsegram grown in the mixed crop. At Hagari Station the yield of the pure cotton crop was higher than that of a mixed crop of cotton and Italian millet. At Koilpatti Station Bengal gram (*Cicer arietinum*), horsegram and coriander were grown mixed with cotton and compared with cotton grown alone. Results indicated that a low proportion of coriander does not affect the cotton yields and is a sound combination, since the produce of coriander from such a mixed crop is an extra gain. At the Central Farm, Coimbatore, it was found that mixed crops with cotton were not financially profitable. Experiments at Gokak Farm, in the Bombay Presidency, indicated that a mixed crop of cotton and *rala* (*Setaria italica*) yielded better than cotton alone, an experience contrary to that at Hagari. At Dharwar Farm cotton and groundnuts in alternate rows gave better results than cotton and groundnuts in blocks. The succeeding crop of sorghum also gave higher yields in plots of cotton and groundnuts in alternate rows than in cotton and groundnuts in blocks.

305. Mysore: Cotton Marketing. By M. Vasudevamurthy. (*Ind. Frmg.*, January, 1942, p. 43.) The effort made by the Department of Agriculture to encourage cotton cultivation in the Maddur and Malavalli areas resulted in the planting of some 3,000 acres. The following agreement is suggested to help in the marketing of the crop. The cultivator agrees to grow the cotton according to Departmental suggestions, pick the cotton clean, and deliver it to a central depot in quantities of not less than 10 maunds at a time. The depot advances seed, implements, oilcake, and gunnies in which to bring the kapas to the depot. After delivery of the cotton an arrangement will be made if necessary to advance to the cultivator part of its value. When sales have been effected by the Department the balance will be paid to him, less the advance. To deal with the cotton so grown and accumulated in the district, Government has sanctioned the construction of a ginning and pressing factory near Maddur at an estimated cost of a lakh of rupees.

306. Mysore: Cotton in Red Soils. By M. Vasudevamurthy. (*Ind. Frmg.*, April, 1942, p. 220.) The Botanical Section of the Agricultural Department is testing varieties of cotton for the red soils in both irrigated and dry tracts. Two

strains that are now grown on a large scale are MA.11 and Co.4. MA.11, evolved by the Mysore Department of Agriculture, grows well on all soils. It is a medium staple cotton with ¾-inch staple, ginning outturn of 30 per cent., and spins up to 30's. It yields 800-900 lb. per acre under irrigation, and even on dry land yields up to 700 lb. have been recorded. It is reported that this variety is rapidly replacing Doddahatti varieties usually grown in the Banavar area of Hassan district. Co.4, one of the important cottons evolved by the Department of Agriculture, Madras, has been found to grow well under irrigation, yielding about 1000-1200 lb. per acre. A staple of 1⅛ inches, 34·5 ginning percentage, and capacity to spin up to 40's, has been reported. This variety has played an important part in the extension of cotton cultivation in the Irwin Canal tract.

307. Improvement Effected by Hybridizing American (Indian) Cottons with a Tree Cotton, *G. Peruvianum*. By G. Sreenivasa Ayyangar. (Mysore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 47.) Red leaf blight causes serious reductions in the yield of American cottons in Mysore. The cross between Dharwar-American and a tree cotton has produced two fixed types of great promise, one of which, MA.11, has proved more resistant to red leaf blight than any other variety.

308. Punjab: A New Commercial Cotton. By M. Amanat Khan. (*Ind. Frmg.*, May, 1942, p. 287.) The variety 124F, bred at the Multan station, has shown promise in the south-western tract and in the Lower Bari Doab Canal colony. The yield was higher than for 289F/43 and 289F/K25. Lint length is nearly 1 inch, and in spinning tests carried out at the Technological Laboratory, Bombay, it spun 43 counts compared with 40 from other similar types. Ginning outturn is 33·3 per cent. and nearly equals that of 289F/K25. It is early maturing, but is inferior to 289F/43 in jassid resistance, and will succeed only in tracts of the Punjab where jassids are not a serious menace to the cotton crop.

309. Investigations on the Partial Failures of Punjab-American Cottons in the Punjab. By R. H. Dastur. (Lyallpur.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 122.) The failures to which the title refers recur frequently and a special scheme of research was instituted to investigate their cause and remedy. Comparison with local cottons revealed a highly significant correlation in yield. The symptoms exhibited by the American cottons indicated starvation of some important nutrient. It was discovered that two soil types were associated with somewhat similar symptoms—namely, (1) soils with nitrogen deficiency and (2) soils with high salinity in the subsoil. The deficiency of nitrogen in the leaves can be readily recognized before they turn yellow by a simple tannin test, and if such fields are manured with sulphate of ammonia the trouble is remedied. No such direct remedy can be applied to the second class of soils. One measure which has achieved marked success in lessening the damage is the reduction of the size of the plant by delayed sowing, compensated by an increase in the number of plants to the acre.

310. Estate Farming in India. III. B.C.G.A. Farm, Khanewal. By Sir Wm. Roberts. (*Ind. Frmg.*, April, 1942, p. 174.) *Origin of N.T. Cotton.* The farm has been used extensively to test on a large scale new varieties of wheat and cotton. In the case of cotton the farm had a major share in introducing 289F, of which a few ounces only were brought by the writer from Mr. Milne's selections at Lyallpur in 1921. All subsequent long-staple types in the Punjab and Sind of the N.T. class are derived from this original seed. The most successful of all is a type selected at Khanewal Farm by Mr. Roger Thomas 8 years ago, and now grown over two lakhs of acres in Bahawalpur and Sind. The total production of 289F types to-day is not less than 4½ lakhs of bales and the area

The Empire Cotton Growing Review

Journal of the Empire Cotton Growing Corporation

Vol. XIX. 1942

Edited by
W. NOWELL, C.M.G., C.B.E.

Abstract Numbers

Published by
P. S. King & Staples, Ltd., 14, Great Smith St., London, S.W.1
for the Empire Cotton Growing Corporation
PRICE : 1s. 3d. each post free.

Printed in Great Britain

under the strain is probably 1,000,000 acres in the Punjab, Bahawalpur and Sind. With Khanewal as a centre, and applying the principles worked out there, the B.C.G.A. has taken large areas on lease in the Punjab, Bahawalpur, Sind, and Baluchistan, and now controls over 200,000 acres of irrigated land, and operates besides 13 ginning and pressing factories and 2 large oil mills. Seed for the Agricultural Department in the Punjab and Bahawalpur and for cultivators in Sind is supplied for well over 2½ lakhs of acres of cotton. The average yield of cotton on the farm for the last two years has been 12½ maunds (1,028 lb.) per acre. The highest average yield of cotton has been 15½ maunds (1,275 lb.) per acre.

311. SIND: KARACHI COTTON ANNUAL, 1940-41, No. 8. (Pubd. by Karachi Cotton Assn., Ltd. Price Rs. 2-8-0.) A useful compendium of all matters relating to the Karachi cotton trade, with particular reference to Sind, the Punjab, United Provinces, and Rajputana. Many statistical tables and charts are included of cotton crops, exports, prices, stocks, consumption, etc.

312. UNITED PROVINCES, COTTON INDUSTRY, 1940-41. (*Karachi Cott. Ann.*, 1940-41, p. 89.) The results of extensive trials of C.402, C.520 and Perso-American under cultivators' conditions all over the United Provinces confirmed for the fourth year in succession the unsuitability of C.402 and the superiority of Perso-American and C.520. Perso-American—a selection from the American types of cotton imported from Iran and acclimatized in the United Provinces—gave an average yield of over 13 maunds per acre at the Government farm Raya. With a ginning outturn of 32 per cent., a staple length of 0·88 inch, it can spin up to 31 counts. During the year under review it covered 3,793 acres, compared with 2,534 acres in the previous year. The demand for seed is such that it is estimated that the acreage in the 1941-42 season will double that of 1940-41. It was sold at a premium of Rs. 2 per maund of kapas over the local unimproved types.

313. AMERICAN VARIETIES OF COTTON AND THEIR CULTIVATION IN THE UNITED PROVINCES. By B. L. Sethi and G. K. Sant. (United Provinces.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 50.) The paper deals with the behaviour of certain American varieties of cotton in the United Provinces, the possibilities of extracting better types from the available material, and the various agronomic factors essential for successful cultivation of American cottons. Trials at six centres in the last three years have established, in general, the superiority of Perso-American over others in yield. The strain referred to was one selected from material introduced to the United Provinces by Dr. Leake several years ago.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

314. THE BRITISH COTTON GROWING ASSOCIATION. The thirty-seventh Annual Report to December 31, 1941, gives an encouraging account of the work of the B.C.G.A. (Punjab), Ltd., and of progress in cotton cultivation in the majority of the Empire countries. The spread of hostilities has presented many and varied problems to the Empire cotton-growing countries—loss of markets, the necessity of growing more food, difficulties of obtaining supplies, and the outstanding problem of shipping space—but most of them have produced very useful crops. In Africa especially, war-time restrictions interfered with the supply to ginning factories of adequate quantities of renewal spares, baling materials, etc., but on the whole the factories were able to operate satisfactorily, and in Nigeria a record crop was handled. The total world production of commercial cotton for the 1940-41 season is given as 28,683,000 bales. Exports by the United States were cut down

to the lowest level since the American Civil War, whereas domestic consumption was on a far higher level than any previously recorded. There was also an increase in consumption in India and Canada.

315. ASIA. CYPRUS: COTTON VARIETY TRIALS, 1940. (*Ann. Rpt. Dir. Agr.*, 1940, received 1942.) Sixteen cotton variety trials carried out in various districts confirmed the previous year's results that Coker 100 is definitely superior to any other cotton grown in the island. Plans have been made to multiply this variety under close supervision to prevent deterioration. A number of selections of cotton have been made in peasants' fields.

316. AFRICA. KENYA COLONY: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Br. Cott. Grwg. Assn.*, 1941.) There was a revival of interest in cotton in the 1940-41 season, the total yield being approximately 15,000 bales of 400 lb. In the Nyanza Province, the main producing area, the season in the northern parts was very favourable, but in the more southerly areas the yield was reduced by drought. Conditions were favourable in the Coast Province and boll disease was comparatively slight.

317. NIGERIA: COTTON INDUSTRY, 1941-42. (*Half-yrly. Rpt. to March* 31, 1942.) *Northern Provinces.* Rainfall and general weather conditions were good from planting time to the middle of September, but at the latter part of the growing season the early cessation of the rains and a corresponding early onset of the Harmattan had a very adverse effect on cotton yields; circumstances arising out of changing war conditions also contributed to low production. Sixty-six gazetted markets were opened for the purchase of seed cotton, compared with 94 in the previous season. This was the second season in which the Produce Inspection Division was responsible for inspection in the main cotton belt; there was a still more rigid enforcement of the Cotton Marketing Regulations and a noticeable improvement in grading and general marketing methods. For the first time a Produce Examiner was posted at each ginnery to check the quality of the cotton coming in and the condition of bags, including sealing and sewing. On the whole grading of the cotton reaching the ginneries was satisfactory, and there was an improvement in the condition of the bags used for transport of the cotton to the ginneries, due to the growing tendency towards a "Standard Pack" of 100 lb. net. The proportion of Grade II cotton was 8·5 per cent. only of total purchases, as compared with 47 per cent. in 1940-41. Provisional reservations of seed for the 1942-43 season amount to just over 6,000 tons, sufficient under favourable conditions for a crop of about 60,000 bales.

Southern Provinces.— Only 13 cotton markets were gazetted this season. Growth of the cotton has been very good, and a really excellent crop is expected which may double that of last season.

318. NYASALAND: COTTON PROSPECTS, 1941-42. (*Nyasaland Agr. Qrtrly. Jour.*, January, 1942, p. 1.) In all areas where the seed distribution of cotton has commenced the demand has been keen, and there are indications that issues will exceed those of 1940-41. Growers were generally satisfied with the prices received for their last crop, and it is anticipated that this will be reflected in an increased acreage during the coming year. The marketing of the North Nyasa crop continues, and 172 tons of seed cotton had been sold by the end of December.

319. NORTHERN RHODESIA: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. of Agr. N. Rhod.*, 1941.) The disastrous preceding season and the demand for labour affected cotton production in the Marambo (Luangwa Valley) area. The number of growers fell from 700 to 525 but the total output was slightly increased. 95,600 lb. seed cotton were purchased, the average return per grower being 10s. 2d.

320. Southern Rhodesia: Conserving Soil in the Native Reserves. By D. Aylen. (*Rhod. Agr. J.*, May-June, 1942, p. 152.) After describing conditions in the Reserves, the author discusses the scope of the work that is being carried out under the following headings:—*Centralization:* The Reserve is surveyed and divided into grazing and arable lands, selecting for each purpose the land best suited to that purpose and utilizing as far as possible the natural features of the country (*i.e.*, hills and rivers) to demarcate the divisions. Village sites are also selected. *Planning and Layout* of the soil conservation works. The roads are also altered to conform with soil conservation principles if this work can be done at a small cost. *Construction* of the soil-conservation works. *Allocation* of plots within the soil conservation works to individual natives, and the gradual removal of huts to the new village site. *Demonstration* of better methods of agriculture, and in certain cases the planting of trees is demonstrated. *Improved water supplies. Maintenance* and supervision of the above items. *Gully control.* In the near future it is intended to engage and train several small gangs for gully control work in the Reserves. The need for better roads for internal traffic is discussed.

This year it is intended to complete the protection of a large block of land in one fairly well populated Reserve, where during the last few years 7,000 acres have already been contour-ridged, by undertaking the work on the remaining 23,000 acres of arable land within this block. The works will be set out for the natives, and under the powers conferred by the Natural Resources Act they will be ordered to construct them. They will be lent 100 "Evans-type" land levellers fashioned from old railway steel sleepers, and a supply of discarded shovels. To encourage adequate construction and ensure completion of the works a small bonus (based on yardage) will be paid to the natives of each village when the works are satisfactorily completed. If the scheme is a success the rest of the arable lands, a further 20,000 acres, will be protected next year. The paper is well furnished with good illustrations.

321. Compost Making. (*Rhod. Agr. J.*, March-April, 1942, p. 46.) It is satisfactory to note a large increase in the total quantity of compost made during 1941 compared with the previous year, but under the present conditions of increasing fertilizer prices, and a possible shortage in supplies, farmers are urged to make every ton of compost they can in order to maintain and increase the production from their soils. The use of compost will, in most cases, make it unnecessary to apply nitrogenous or potash fertilizers to their crops, and will greatly economize phosphatic fertilizers since reduced quantities may be employed. At the same time the humus in the compost will help to maintain the all-important crumb structure of the soil on which the tilth depends. During the year 674 farmers manufactured 236,727 cu. yds. of compost (approximately 118,363 tons), compared with 148,959 cu. yds. (approximately 74,480 tons) in 1940. It is hoped that every farmer will consider it a national duty to make the greatest effort to increase his production of this most valuable source of soil fertility.

322. Erosion and Malaria. By G. R. Ross and D. Aylen. (*Rhod. Agr. J.* April, 1941, p. 173.) Discusses the relationship between erosion, the disease of the soil, and malaria, the disease of the body, and the measures recommended for the control of both evils.

Gully Control. By D. Aylen. (*Rhod. Agr. J.*, March-April, 1942, p. 73.) A continuation of the previous paper, describing various new features or methods of gully control, and points which make for success or disaster, which have come to light as the result of recent experiments. Both papers are well furnished with illustrations.

323. South Africa: Cotton Industry, 1940-41. (*Rev. of* 1940-41 *Cott. Crop*, received 1942.) General climatic conditions during the growing season were

fairly good, and a satisfactory crop was produced. In contrast with previous years, when most of the cotton was exported, the entire crop was taken by South African industries. The demand was much larger than the supply; prospects for cotton growers, therefore, seem good.

324. COTTON PROSPECTS, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) Planting rains were early, but sketchy in some districts. While other crops were said, in February, to be suffering from drought, cotton reports at that time were favourable. Guaranteed prices may lead to larger acreages of cotton being planted in the future.

325. SWAZILAND: WORK OF THE COTTON EXPERIMENT STATIONS, BREMERSDORP AND CROYDON, 1940-41. By J. V. Lochrie. (*Prog. Rpts. Exp. Stats.*, 1940-41. *Emp. Cott. Grwg. Corpn.*) The season was marked by rainfall below average, and at both Stations the season was short. Insect pests were not important, but at Bremersdorp bacterial bollrot caused considerable loss. Cotton strain tests were carried out in conjunction with the Barberton Station. A series of fertilizer experiments was conducted both on cotton and maize. At Bremersdorp all results indicated the primary necessity of phosphate for plant growth and yield, while potash and nitrate of soda gave excellent returns at Croydon. The application of compost gave good results. The effect of cotton on the subsequent growth of maize was good, but the complication introduced by witchweed infestation affected the final yields. The beneficial results of early weeding were demonstrated. Other crops, mainly legumes, were cultivated. Groundnuts and beans grown for grain did not do well, but others grown for forage or compost making were satisfactory; of these velvet beans proved the most successful.

326. SUDAN: WORK OF THE PLANT BREEDING STATIONS, 1940-41. (*Prog. Rpts. Exp. Stats.*, 1940-41. *Emp. Cott. Grwg. Corpn.*) The main points emerging from the season's work are as follows: The successful production in bulk of Sakel-type cottons carrying a considerable measure of resistance to blackarm (*B. malvacearum*) now seems more than probable in the near future. Substrains of the Sakel selection N.T.2 have continued to give good results, and their resistance to leafcurl disease has been further demonstrated. An American Upland variety which may prove more profitable than the existing type in the Nuba Mountains has reached an advanced stage in bulk propagation, while a further strain has shown great promise in replicated trials. Introductions from Uganda have shown promise in Equatoria, particularly as regards earliness of cropping, while locally-bred types also gave good yields. A recommencement of systematic work on the dura crop has been made. Dura is the staple crop of the country and occupies 1½ million acres annually. In the Gezira it takes a definite place in the rotation with cotton.

327. TANGANYIKA TERRITORY: CROP PROSPECTS, 1942. The crop report for February, received from the Department of Agriculture, states that a dry period in the Lake, Central, Eastern, and Southern Provinces has led to a deterioration in the crop position in many areas, and rain is urgently needed. In some areas, however, rain was experienced at the very end of February. It is not anticipated that there will be any difficulty in meeting local food shortages should they occur. Cotton prospects remain good, while a fair groundnut crop is anticipated.

328. COTTON PURCHASE. (*Crown Colonist*, August, 1942, p. 539.) H.M. Government has undertaken to purchase all non-native and third-quality cotton produced in Tanganyika, elsewhere than in the Lake Province, which remained either unsold or unshipped at the end of April, 1942, at a valuation not exceeding £10 per bale in the case of non-native cotton and £5 10s. per bale in the case of third-quality cotton. A strict condition of such purchase is the production of

evidence by the vendor that up to that date he has been either unable to sell the cotton or unable to ship it. Government has appointed the Tanganyika Cotton Co., Ltd., of Morogoro, to be Honorary Government Agent for the purchase of this cotton.

329. Combating Soil Erosion in the Central Province of Tanganyika Territory. By R. R. Staples. (*E. Afr. Agr. Jour.*, vii. 3-4, 1942, pp. 156, 190.) Accelerated erosion in its most advanced forms menaces the welfare of the African peoples inhabiting the Central Province of Tanganyika Territory. This problem is bound to arise where some half a million natives, one and a quarter million cattle and a million sheep and goats are all engaged in an often desperate struggle for existence (largely due to the primitive methods of land use) in a semi-arid country. The need for soil conservation in the Province is so pressing that it has been decided that anti-erosion work shall form the basis of increased production work even in war-time. An account is given of the efforts being made to overcome the evil. Part I opens with a general description of the region: physiography, geology and soils, climate and rainfall, vegetation, population, stock and crops. This is followed by a brief account of various soil-conservation projects that have been started in the Mpwapwa, Dodoma, Manyoni, Kondoa, and Singida districts, and of the results achieved. Part II describes soil-conservation measures which investigation and experience over the past 10 years have shown to be most suitable for Central Province conditions; these include deferred grazing, ridge cultivation, contour banks, bush clearing, grass planting, manuring, hedging, and planting windbreaks. To enable more rapid progress to be made in the application of the soil-conservation measures considered suitable, the author suggests that under present conditions (*i.e.*, in the absence of a Soil Conservation Section for the Territory) the best plan would seem to be to appoint a standing provincial committee to control all soil-conservation projects in the Province. The members would naturally be the representatives of the departments concerned, and would have as their chairman the Provincial Commissioner. It might be a subcommittee of the proposed Provincial Welfare Committee, and could possibly deal with all matters connected with land use in the Province.

330. East African Agricultural Research Station, Amani, Tanganyika Territory. (*Ann. Rpt.*, 1941. Pubd. H.M. Stat. Off., 1942. Price 3d. net.) The work of the Station during the year was mainly devoted to war-time investigations, full reports of which were issued separately as each investigation was completed. Shortage of staff, particularly chemists, was a great handicap, but certain lines of agricultural research were continued on a reduced scale.

331. Uganda: Cotton Industry, 1941-42. (*Crown Colonist*, May, 1942, p. 306.) The cotton season reopened in Buganda Province on March 12 and in the Eastern Province on March 16. The price to growers was Sh. 8·50 per 100 lb. of seed cotton for best quality at Kampala, proportionately reduced in outer districts. Arrivals were very heavy at first, but diminished after the purchase of the Eastern Province crop. The average grade was good and considerable quantities were purchased by Government.

332. Cotton Prospects, 1942-43. In the report of the Department of Agriculture for June it is stated that, owing to abnormally wet weather and to the fact that increased acreage is being planted to food crops, the preparation of the new season's cotton crop is not so far advanced as usual. Active steps are being taken in all Provinces to ensure that cotton is planted as early as possible and that it is sown at the correct spacing of 3 ft. by 1 ft.

333. A New System of Grass-Fallow Strip-Cropping for the Maintenance of Soil Fertility. By A. J. Kerr. (*Emp. J. Exp. Agr.*, x., **39**, pp. 125-132,

July, 1942.) This paper by a member of the staff of the Uganda Department of Agriculture describes a further advance in the efforts of that Department to accelerate the operation of the native system of shifting cultivation without reducing its merit as regards soil regeneration and conservation. The author emphasizes that the native system restores to used land the crumb structure which it has lost under cultivation and which is all-important for the absorption of water and the prevention of erosion. Previous work has established that under the conditions prevalent in Buganda the use of planted elephant grass in place of the natural ecological succession for the fallow period reduces the time required for satisfactory regeneration to three years or less.

The drawback to operating this method in its simplest form on native holdings, by throwing out half the land at one time, is that all the work involved in the change-over falls into the same year. The system now proposed is that the unit of land should be divided into six plots over which the work is rotated in a 6-year course. Where the land is sloping the plots should take the form of six strips running across the slope. These may be regarded as three pairs, one of which is in cultivation each year and one resting. In the second year, to get into the rotation, the strips in the first pair are changed round; in the third year those in the second pair, and in the fourth year those in the third pair. Each strip thus receives 3 years' cultivation followed by 3 years' resting, and in any one year after the rotation is established one of the three cultivated strips is in its first year of cultivation, one in its second year, and the other in its third year, while the same applies to the three resting strips. The strip system operates against erosion both by restoring the crumb structure and by the effectiveness of the resting strips in stopping wash.

The paper proceeds to discuss the application of the system to Buganda conditions and to consideration of its advantages and its one disadvantage, the latter consisting in the departure from native practice involved.

334. Soil Problems. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) The Department of Agriculture has drawn up a policy to deal with problems of soil conservation, and two areas have been selected, one in Buganda and the other in the Eastern Province, where an intensive programme is being carried out under the administrative and technical officers working as a team. It is hoped that these areas will serve later as demonstration units whereby the chiefs and their people will be stimulated to put into general practice those conservation methods which have proved successful. The Department also reports a general improvement in cultivation methods, particularly in regard to closer spacing, early planting, and the fact that cotton is now less frequently planted up and down hill on sloping land, but along the contours, thus checking soil erosion. Experiments are being directed towards raising the yield of cotton per acre rather than to increasing the acreage under cultivation; in the main cotton-growing areas expansion of acreage is held to be likely to lead to soil deterioration, and increased output should be sought through improved methods of cultivation.

335. AUSTRALASIA. Queensland: Cotton Industry, 1940-41. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) Plant breeders were employed on breeding cottons suited to the conditions in different areas, and in particular in the search for a variety resistant to the jassid pest. In this connection it is interesting to note that material derived from a hybrid in which one of the parents was U.4, which originated at the Corporation's Station in the Transvaal, is stated to contain some promising strains.

The advantages to be derived from growing cotton with supplementary irrigation facilities were demonstrated at the Research Station, an average yield of nearly 1,500 lb. of seed cotton per acre being obtained on the irrigation plots,

compared with 420 lb. on the rainfall plots. Problems which are absent when cotton is a rain-grown crop at once present themselves under irrigation conditions, and these are receiving attention in the experimental work. In Queensland, as a whole, weather conditions in 1940-41 were not conducive to high yields; nevertheless a considerable increase was obtained over the output of the previous year.

336. THE COTTON INDUSTRY IN AUSTRALIA. By J. D. Young. (*Prod. Rev.*, 15/11/41. From *Cott. Lit.*, March, 1942, p. 91.) A lecture given before the Blennerhassetts' Commercial Educational Society of Australasia. Australia consumes about 350,000 bales of raw cotton of 500 lb. each per annum; only 13,000 bales of this are grown in the country, all of which comes from Queensland. Reasons why Australia is not self-sufficient in raw cotton production are given.

337. WEST INDIES: THE WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The Sixth Ordinary General Meeting of the Association was opened in St. Vincent on October 31 last by His Honour the Administrator, who in his address of welcome strongly advocated the use of Sea Island cotton since he had proved from personal experience the excellence of the garments made from it. The President of the Association, Mr. C. C. Skeete, in his address stated that in general the past season had been fairly successful. Yield per acre had been above the average, increased acreage had been planted in Antigua, Montserrat, and Nevis, and production had reached a new record. Referring to production, the President said that he thought they would agree that there was a limit to the area on which it was economically suitable and, for some reasons, wise to grow cotton, and in his view they were approaching the limit and reaching a stage beyond which—except possibly in the case of Barbados—it would be dangerous to undertake further expansion. The danger lay in two main directions. Firstly, in the majority of cases any further increase would be at the expense of the area under food crops, and food crop production was still below the level required in the present emergency. Secondly, the interests of soil conservation demanded the exercise of great caution in bringing further areas under cotton until more suitable—that is, more soil-conserving—methods of agriculture were practised.

War conditions had reduced to a minimum the activities of the Advisory Committee in England, since little raw Sea Island cotton was going into consumption for commercial use, and trade in Sea Island cotton goods was necessarily small. The Association had rendered a great service to the Sea Island cotton industry by its decision to continue the accumulation of a reserve fund. This was considered a very sound policy, and the hope was expressed that it would be continued without modification during the coming year. Mr. Skeete paid tribute to the great value of the cotton-breeding work carried out under the direction of the Cotton Adviser, Mr. J. B. Hutchinson. The spinning tests undertaken at Mr. Hutchinson's request by the Shirley Institute of the British Cotton Industry Research Association had yielded valuable information, and the Cotton Adviser was now in a better position to plan cotton-breeding policy for the islands. The problem of pest control was also discussed, and the need was stressed for continued watchfulness in all the islands on the measures taken to control cotton pests. Finally, the important subject of marketing was dealt with. The President stated that the normal commercial outlet for their cotton was temporarily closed, but a contract made with the Ministry of Supply ensured a market for Sea Island cotton at a very reasonable price for a specified period during which they would otherwise have found it very difficult to dispose of the crop.

The report also contains full statistical information relative to the cotton industry, and a note by Mr. J. B. Hutchinson on "The present position with regard to spinning tests of Sea Island cotton," in which appreciation is expressed of the help afforded by the Shirley Institute of the British Cotton Industry Research Association in carrying out spinning and hair tests on samples of Sea Island cotton, which has enabled much valuable information to be obtained on the variations in quality of the cotton in the different West Indian islands.

338. The West India Committee. Report of the Executive Committee for 1941-42. (*W. Ind. Comm. Circ.*, June, 1942, p. 85.) Owing to war conditions the work of the Advisory Committee in England of the West Indian Sea Island Cotton Association, on which the West Indian Committee is represented by its secretary, has been restricted. The Association's certification trade mark has been maintained and 66 certificates have been renewed for the year 1942. At the beginning of the year under review the Home Government became the sole importer and distributor and only a very small quantity of raw Sea Island cotton has been available for general consumption.

The area devoted to the 1940-41 crop in the West Indies was 21,550 acres, and production amounted to 8,413 bales of 400 lb. each. Both figures were the highest in the history of the industry. Of the total production, 7,963 bales were clean lint, which was purchased by the Ministry of Supply at 25d. per lb. for St. Vincent "superfine" and 22½d. per lb. for the "Montserrat strain" grown in the Leeward Islands. The output of Marie Galante cotton during 1940-41 was 899 bales, against 701 bales in the preceding season.

339. The Imperial College of Tropical Agriculture, Trinidad. The Principal's report for 1940-41 indicates that teaching and research were continued during the year without interruption notwithstanding difficulties due to the war in connection with transport, higher living costs, and competition for the services of subordinates and labourers by the United States' bases and the oilfields. Research was mainly concerned with cacao, sugar-cane, and bananas, and summaries are included of the work carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. A notable event of the year was a two-day meeting at the College of Sugar Technologists from all the West Indian sugar-producing colonies, at which several interesting and important papers were read and discussed. The number of students in residence on December 31, 1941, was 72. Thirty-one scientific papers were published during the year, including those contributed to *Tropical Agriculture*. The following additions were made to the Library: parts of periodicals, 8,637; pamphlets, 1,456; books (purchased) 128; books (presented) 19.

340. Barbados: Cotton Industry, 1940-41. (*Ann. Rpt. Dpt. Sci. and Agr., Barbados*, 1940-41.) 453 acres were planted to cotton, compared with 120 acres in the previous year. Growth was good and yields of seed cotton were above the average, and totalled 179,155 lb. The ginning percentage, as recorded by the Barbados Co-operative Cotton Factory, was 25·66 per cent. For the second year in succession no pink bollworm was found, and it is hoped it is being effectively controlled by the measures adopted. The cotton leafworm, *Alabama argillacea*, made its appearance in December, but was kept in check by efficient dusting and spraying. The holds of 17 ships were fumigated with "Zyklon B" and 12,520 bags of imported cotton seed were disinfected by means of the Simon's Heater.

Progeny row selection work was continued during the year, and the seed from these plants will be grown to provide commercial planting material for the 1942-43 crop. The selfed seed of the "bulked" seed cotton from the 1939-40 progeny

rows, grown at Codrington Experiment Station this season, will be distributed for commercial planting for the 1941-42 crop.

341. COTTON INDUSTRY, 1941-42. (*W. Ind. Comm. Circ.*, May, 1942, p. 77.) Peasants' cotton has been seriously defoliated by the cotton worm (*Alabama argillacea*). In spite of persistent advice by the Peasants' Agricultural Instructors to spray or dust as a preventive against this pest, little dusting and no spraying was done, and as a result of severe defoliation many peasants' plots have been pulled up and the land planted in sugar-cane or food crops.

342. MONTSERRAT: COTTON INDUSTRY, 1940. (*Ann. Rpt. Dpt. of Agr., Montserrat*, 1940, received 1942.) Planting began on March 11 and ended on May 26. Germination of the seed was good, and wherever conditions of moisture were favourable the crop quickly became established. Destruction by grasshoppers and crickets made extensive supplying necessary. There was a fairly severe infestation of aphids and also slight attacks of *Alabama argillacea*. Pink bollworm did little damage to the main crop, but bolls which developed late in the season were heavily infested. The proportion of stained lint to clean lint was below normal, the main causes of staining being green bug, pink bollworm and cotton stainers. Acreages of cotton under the three systems of tenure in 1940 were: Freehold or rented lands worked by peasants, 1,838; Share System, 1,564; Estate Cultivation, 1,194; making a total of 4,596, a record acreage under cotton in Montserrat. The number of peasants working freehold or rented land was 2,508. The crop produced 998,310 lb. lint, giving a yield of 217 lb. per acre, a figure above the average for the past few years. Throughout the cotton-picking season local buyers bought clean seed cotton at 5½d. per lb. The whole of the crop of clean lint was purchased by the Government at 1s. 11½d. per lb. f.o.b. and shipped to the Ministry of Supply.

343. COTTON BREEDING EXPERIMENTS, 1940. (*Ann. Rpt. Dpt. Agr., Montserrat*, 1940.) Germination failures in 1939 resulted in the loss of a large part of the pedigree breeding material and made necessary a considerable departure from the normal breeding procedure. The majority of the 1940 material, in consequence, came from single plant selections made in the first multiplication plot, and in the four selected second generation bulks carried on in 1939. On their behaviour in non-replicated rows, ten of the selections made in commercial fields in 1938 were also included to give, in all, forty progenies for the main replicated progeny row trial of 1940. After detailed analysis, single plant selections were made from nine of these to be parents of the 1941 progeny rows. Progenies of the two plants germinating in the main breeding trial of 1939 were grown non-replicated and selections made for inclusion in the 1941 breeding scheme.

In 1930 seed from a progeny representative of the breeding material of the day was sent to the St. Vincent Type Collection. Here it was maintained until 1936, when a plant was sent to the Cotton Research Station in Trinidad, where it has since been carried on by grafting. Seed from this plant was returned to Montserrat in 1939 under the name Ba-1-5, and from this material five progenies were grown in non-replicated rows in 1940 and selections made for trial in the main breeding experiment in 1941. A small plot trial was carried out to compare four selected bulks, the two types selected from commercial fields in 1938, and type Ba-1-5. Analysis showed that the modern strains were superior in yield of lint, lint per boll, lint index and ginning percentage, but were inferior to Ba-1-5 in lint length and seed weight. The field selections as a whole were inferior to the selected bulks, but no differences were observed between the two types of commercial field selections. Between the four bulks there were differences in many of the recorded characters, and the best two were selected for separate multiplication.

344. Cotton Variety and Manurial Trials. (*Ann. Rpt. Dpt. Agr., Montserrat*, 1940.) Four Sea Island strains—viz., St. Vincent Superfine (V 135), St. Vincent Ordinary (BD), Sea Island White Flower (SIW) and a V 135 × MSI hybrid—were tested against the standard Montserrat Sea Island strain (MSI). Only one variety, BD, compared at all favourably with the local strain. Its yield, expressed as seed cotton per acre, exceeded that of MSI by 173 lb., or 20 per cent., but due to the higher ginning outturn of the latter yields of lint were practically the same for both varieties.

A single level NPK factorial experiment in which the triple interaction N × P × K was confounded with blocks, was carried out at Whites Estate. Eight sub-blocks were employed and the plot size was $\frac{1}{10}$ acre. A plot manured with cottonseed meal was included in each sub-block for comparison with the artificials. The manures were applied 5 weeks after sowing at the following rates:

N. Sulphate of ammonia	2 cwt. per acre
P. Superphosphate	2 „ „ „
K. Sulphate of potash	1½ „ „ „
CSM. Cottonseed meal	6 „ „ „

Sulphate of ammonia, acting mainly through boll size, produced an average increase in yield of 160 lb. seed cotton per acre, and, in spite of a significant depression in ginning outturn, an increase of 46 lb. lint per acre, or about 10 per cent., was obtained. At the prevailing market prices of lint, fertilizer, etc., this represents a difference of about £2 12s. in the net return per acre. A difference of 38 lb. lint per acre was observed in favour of plots manured with superphosphate. This difference, which, however, fell just short of the level required for statistical significance, was mainly due to an increase in the number of bolls matured. There was no response to the application of either sulphate of potash or cottonseed meal, and heavier dressings of the latter appear to be indicated. No significant interaction between any two of the three artificial fertilizers was observed.

345. St. Vincent: Purchase of Seed Cotton. (*W. Ind. Comm. Circ.*, June, 1942, p. 97.) The advances to be paid by the Government Cotton Ginnery on Sea Island seed cotton of the 1941-42 crop, purchased on the cöoperative system, have been fixed at 9c. per lb. for white and 1½c. per lb. for stained.

COTTON IN THE UNITED STATES.

346. Cotton Quality Statistics, United States, 1939-40. (*U.S. Dpt. Agr.*, Washington, D.C., 1940.) This is a continuation of a series of reports issued previously under the title of "Grade, Staple Length, and Tenderability of the Cotton in the United States." Information is given concerning the quality of cotton on hand in the United States as at August 1, 1939, and the quality of cotton ginned during the 1939-40 season. For the first time figures are included showing the grade and staple length of the supply (carry-over plus crop) and the disappearance of Upland cotton.

1940-41 Season.—Information is presented on the quality of cotton on hand in the United States at August 1, 1940, and the quality of cotton ginned during the 1940-41 season.

347. American Cotton Crop, 1942-43. Cotton Growers urged to plant their Full Allotment. (*Cotton*, M/c, 18/4/42, p. 6.) The U.S. Secretary of Agriculture called upon United States cotton farmers to plant their full AAA allotment of about 27,400,000 acres of cotton in 1942, and recommended that as much as possible of this allotment be planted in medium- and long-staple varieties,

so that the United States may be assured of adequate supplies of the qualities needed to meet military requirements.

348. Long-Staple Cotton used in War Specialities Placed under Restrictions. (*Cotton*, M/c, 29/8/42, p. 6.) Reports from Memphis are to the effect that all long-staple cotton needed in the production of military fabrics, including barrage balloons, life rafts and parachute shroud lines, was recently put under rigid restrictions by the War Production Board. The delivery of cotton linters and hull fibre essential in the manufacture of chemical cotton pulp for explosives and plastics was also prohibited except to specified manufacturers. The restrictions already in effect on the better grades of imported Egyptian cotton were tightened up and also applied to American extra staple cotton. These restrictions now apply to Giza 7, Sudan, Sakha 3, Sakellaridis, Malaki and Karnak, all of which are Egyptian cottons, and also to SXP, Pima and Sea Island cotton grown in America. Pima is also produced in Peru and imported by the United States.

349. Cotton Spindles: Activity in the United States, 1932-41. Assen. of Cotton Textile Merchants. (*Cotton*, U.S., **106**, 4, 1942, p. 98. From *Summ. Curr. Lit.*, xxii., 14, 1942, p. 342.) Statistics of spindle activity and cloth production are tabulated. "Spindles in place" have declined from 32,326,526 at the beginning of 1932 to 24,146,130 in 1942, but the percentage of "average active spindles" has risen from 71·92 to 93·53.

350. Textile Fibres: Consumption in United States, 1941. (*Rayon Organon*, **13**, 1942, p. 32. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 151.) Raw cotton consumption in 1941 reached the record of 5,207,200,000 lb., whilst wool consumption of 652,200,000 lb. was 54 per cent. greater than the previous record of 1923. The increase is due to military, naval and industrial demands and to an increase in civilian purchasing power.

351. Loss of American Cotton by Insects. (*Cotton*, M/c, 18/4/42, p. 6.) A conservative estimate is that, on an average, 1,500,000 bales of cotton worth $120,000,000 are lost each year to cotton-devouring insects. The number of bales destroyed in 1941 was even much greater. In addition, there are also destroyed 235,200,000 lb. of cottonseed oil worth $27,224,000; 117,675,000 lb. linters worth $8,237,250; 784,500 tons cottonseed meal worth $31,380,000; and 98,000 tons of cottonseed hulls worth $784,000. This totals up to a loss of $187,625,250, of which amount $75,000,000 is for Texas alone.

352. Industrial Fibre Society: Formation. (*Cotton*, U.S., **106**, 1, 1942, p. 64. From *Summ. Curr. Lit.*, xxii, 6, 1942, p. 152.) A brief report of the initial meeting of the Industrial Fibre Society which has been founded in America by a group of research physicists and chemists connected with southern textile plants. The purpose of the organization is to bring together the men in textile manufacturing plants and laboratories, and others who have a mutual interest in the technical side of textile fibres, to study the fibres, their uses and applications, etc. The initial meeting was attended by technical and research men and others from textile plants, technicians from government and other laboratories and from several educational institutions. The general theme of the meeting was "Evaluation and Correlation of Fibre and Yarn Properties" and discussions were held on the application of physics to fibre studies, the physical properties of cotton and their relation to factors governing utilization, the chemistry of the cotton fibre, chemical tests on the cotton fibre and their significance, and the correlation of fibre properties to yarn strength.

353. American Textile Schools: Organization. By D. E. Heard. (*Rayon Text. Monthly*, 23, 1942, pp. 75, 167, 295. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 317.) A general review of textile education in the United States, with particular reference to the organization of research. There are five important textile schools in the Eastern States and five in the South; they are briefly described.

354. Alabama: Avondale Mills: Management. By Avondale Mill Managers. (*Cotton*, U.S., **106**, 2, 1942, p. 82. From *Summ. Curr. Lit.*, xxii., 8, 1942, p. 177.) The Avondale Mills comprise a group of eleven mills, of which six are for spinning and the others do spinning, weaving, and dyeing and finishing. There are altogether 137,860 spindles and 4,330 looms, and a wide range of yarns and fabrics is produced. The organization of the mills is described by the managers in the following chapters: The management's viewpoint; Maintenance of buildings; Good housekeeping and maintenance of safe practices: Village maintenance; Maintenance of mill machinery; The Avondale research and testing laboratory; Maintenance of humidifiers and compressors; Maintenance of power and electrical equipment; Maintenance of fire-protection facilities. Many useful practical hints are given.

355. Georgia: Cotton Experiments, 1940-41. (*53rd Ann. Rpt., Exp. Sta. Ga.*, 1940-41, recently received.) In North Georgia Stoneville 2B and D. and P. L. 11A continued to be the most profitable varieties. Coker 100 also has a good record but is very susceptible to wilt. In South Georgia Coker 4 in 1, Coker Clevewilt 7, and Wannamaker Cleveland Wilt-Resistant maintained their superiority over other varieties, with a high wilt resistance, staple of 1 in. or over, and fair ginning outturn. Of the $\frac{7}{8}$-in. cottons Rhyne Cook made the best showing, with good yields and excellent wilt resistance. A study of the reaction of cotton varieties to cotton wilt and root-knot nematode indicated no variety as immune to root-knot though some were highly resistant. In general, a close positive relationship existed between wilt resistance and root-knot resistance. Such varieties as Early Wilt, 4 in 1-3, 4 in 1-4, Cleveland W.R.6, Rhyne Cook, and Early Cleveland W.R. combine resistance to both pathogens. Treatment of seed with ceresan continued to be the most effective means of controlling anthracnose disease. Other work in connection with cotton carried out during the season included genetic studies, breeding experiments, varietal trials, fertilizer experiments and soil investigations.

356. Cotton Research Laboratory, New Orleans. (*Text. Manufr.*, January, 1942, p. 41.) Four regional research laboratories were authorized by the U.S. Agricultural Adjustment Act, 1938, "to conduct researches into and to develop new scientific, chemical and technical uses and new and extended markets and outlets for farm commodities, products and by-products." The New Orleans Station is now completed and equipped, and the work of the Cotton Fibre Research, Processing, and Chemical Finishing Divisions is briefly discussed. This research station is an American equivalent of the Shirley Institute of the British Cotton Industry Research Association.

357. Cotton Seed: Breeding in the Mississippi Delta. By M. G. Barnwell. (*Text. World*, **92**, 5, 1942, p. 73. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 293.) Cotton seed breeding in the United States is carried out by three distinct groups: (1) The Federal and State supported experiment stations, of which the Delta Experiment Station is a leading example; (2) Commercial breeders who supply pedigreed seed, selected, fumigated and scientifically packed, to cotton planters throughout the entire cotton belt as well as to foreign cotton-growing countries; (3) So-called multipliers or cotton planters who buy pedigreed seed from a certified breeder and sell, under certificate of the State Seed Improvement

Association, selected seed from their own planting, each bag of seed tagged to show its lineage. Brief accounts are given of the development and work of the Delta Experiment Station, the Delta and Pine Land Co., which developed Delta-pine cotton, the Stoneville Pedigreed Seed Co., which produces seed of various types, the most important of which are Delfos and Stoneville 2B, the Robertshaw Plantation, which is developing a variety called Bobshaw, and Coker's Pedigreed Seed Co. of Hartsville, South Carolina. The improvements and profits made possible by the breeding work of the last 40 years are discussed.

358. Cotton Prospects in Oklahoma and Texas, 1942-43. (*Curr. Farm Econ.* Oklahoma Agr. Exp. Sta., June, 1942, p. 76.) "The outlook for the present crop is none too encouraging in Oklahoma and Texas, though other states are reporting satisfactory progress. Heavy and excessive rains plus a cold spring retarded planting by at least three weeks in most sections, and may likely prove detrimental to yields. Weevils do considerable damage to late cotton in eastern Oklahoma, and in the western section a late crop is subject to frost damage. Late cotton is usually low in grade and poor in staple character."

359. Quality-Price Relationships of Cotton at Local Markets in Oklahoma. By T. R. Hedges. (*Oklahoma Sta. Bull.* 250, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 695.) This investigation has shown that a policy of paying producers a set price for all grades of cotton, rather than varying prices for individual bales according to their quality, is detrimental both to the growers and to the industry. The policy penalizes producers of premium cotton and subsidizes those growing the low-quality cotton, thereby encouraging growers to increase the proportion of low-quality cotton in the total crop. This makes it harder and harder to find a market for Oklahoma cotton, and forces ginners to offset losses incurred in transactions in cotton with earnings from other departments of their businesses, and thus produces an artificial market for cotton.

360. Cotton Marketing in South Carolina. By W. T. Ferrier and H. A. White. (*S. Car. Sta. Bull.*, 335, 1941. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 406.) The study deals with the marketing of the 1939-40 crop. It analyses and discusses the price-quality relationships, losses resulting from gin damage, price variations due to transportation costs and to quality, and the production and demand and supply situation in the State. . . . The study confirmed previous findings of South Carolina and other State Experiment Stations and of the U.S. Department of Agriculture that prices paid in local markets are usually average or "round-lot" prices and do not reflect differences in quality of individual bales; that differences of quality as between growers are frequently not recognized; and that growers of poor-quality cotton are often overpaid while growers of high-quality cotton are underpaid. Differences ranging up to $5 per bale were paid in the same market on the same day for cotton identical in class. Variations in price were more often for differences in staple than for differences in grade. . . . Losses from bad ginning averaged $3.49-$4.42 per bale of the cotton so damaged in the four markets studied.

361. University of Tennessee Cotton Fibre Testing Service and Apparatus. (*Rayon Text. Monthly*, **22**, 1941, p. 734. From *J. Text. Inst.*, March, 1942. A140.) Scientific measurements of the length, fineness and strength of cotton fibres are offered by a new cotton-testing service inaugurated by the University of Tennessee Fibre Research Laboratory. The "Fibrograph" and the "Arealometer" will be used for measuring average fibre length and fineness and the "Pressley" instrument for testing the strength of fibres. With present facilities, the service can test and measure from 100 to 125 samples a day.

362. Texas: Cotton Experiments. By J. E. Roberts. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, received 1942.) For the 14-year period (1927-40) treatment with 12 tons of manure and 400 lb. superphosphate to the acre produced the highest yield: 371 lb. lint to the acre, or 150 lb. more than the average of the plats which received no treatment, and 72 lb. more than the average of the five check plats which received 400 lb. of 4-12-4 commercial fertilizer to the acre. Treatment with 12 tons manure per acre produced the second greatest yield: 350 lb. lint. In an experiment carried out over the period of years to determine the relative merits of different nitrogenous fertilizers, nitrate of soda produced the highest yield: 285 lb. lint to the acre, and sulphate of ammonia a comparable yield of 272 lb. Those plats receiving the minor elements, boron and manganese, yielded 203 and 136 lb. lint per acre respectively.

In a varietal test carried out in 1940 of 54 varieties randomized in six replications, the highest yielding strains were: Washington, 220 lb. lint; Stoneville 2B, 218 lb.; D. and P. L. 44-51, 217 lb. lint per acre. On the basis of comparable yields among cottons grown for 10 years or longer, the highest yielding strains were: Ferguson 406, 248 lb. lint per acre; Startex 619, New Boykin, and Sunshine, each of which produced 233 lb. per acre.

363. Texas: Physical Characteristics in Cotton and their Interrelationship. By M. A. Grimes. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 114.) Succeeding generations of hybrid lines resulting from a cross of Lightning Express and Half-and-Half varieties (cotton furnished by the Division of Agronomy) were studied. It was found that the fibres of the Lightning Express parent were longer, finer and stronger than those of the Half-and-Half parent. The average length of the F_1 fibres was midway between the average lengths of the two parents; that of the backcross of the Lightning Express and F_1 was the same, and that of the F_2 generation nearly the same length as Lightning Express. The F_1 and F_2 generations were approximately midway between the two parents in fineness. The backcross was slightly finer than the finer parent, Lightning Express. The fibres of intermediate length had in general a higher percentage maturity than those of the longest and the shortest length. No inheritance of maturity was indicated. In each of the five lots of cotton there was a high positive correlation between length and fineness. Both length and fineness were closely correlated with strength. The F_1 and the backcross were approximately equal in strength. The strength of the F_2 was slightly less and that of the F_1 greater than the average of the two parents. In no case was it possible to assign a definite factorial or genetic basis for the inheritance of the several properties studied, although multiple factor independent inheritance was indicated.

[*Cf.* Abstr. **486**, Vol. XVIII. of this review.]

364. Texas: Breeding Cotton for Mechanical Harvesting. By D. T. Killough *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 66.) The desirable type of plant for mechanical harvesting should be characterized by medium height, relatively short noded fruiting branches, not more than one minor vegetative branch, open-type growth, light foliage with small leaves that shed early, and a medium-sized, strong storm-resistant boll, borne singly on a peduncle that snaps easily under tension. In addition, the fibre should be relatively harsh bodied, dense on the seed, of medium staple length, and have sufficient interseed drag to keep the locks relatively compact for best results in cleaning mechanically harvested cotton. Several promising hybrids bred at College Station and Lubbock appear relatively uniform for the desired characteristics: Half-and-Half × Acala, Ducona × Mebane 140, Clark × Acala, and Half-and-Half × Lone Star, all of which are characterized by a high mechanical

harvesting efficiency, good yield, good cleaning qualities, desirable staple length, and relatively high percentage of lint. The improved strains are being increased.

365. MILLER 610, A COMMERCIAL VARIETY OF WILT-RESISTANT COTTON FOR EAST TEXAS. By P. A. Young. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 222.) In the regional cotton variety wilt test conducted in coöperation with the U.S. Department of Agriculture, using 600 lb. of 6-6-6 and 6-12-6 fertilizer per acre in land heavily infested with *Fusarium vasinfectum*, Miller 610 cotton averaged 2,027 lb. seed cotton per acre, which was 82 per cent. more than the yield of comparable Half-and-Half cotton. Dixie Triumph 06 yielded 1,898 lb. seed cotton and Wannamaker's Early Wilt Resistant cotton 1,828 lb. seed cotton per acre. All varieties yielded better with 6-6-6 than with 6-12-6 fertilizer, possibly due to excess phosphate from residue in the soil. Miller 610 appears well adapted and valuable for commercial use in East Texas as it has shown strong wilt resistance, long staple, large bolls, and high yielding capacity in dry and wet seasons of the last four years. It has been satisfactory in commercial tests for the last three years.

366. COST AND PROFIT OF GINNING COTTON IN TEXAS. By W. E. Paulson. (*Bull.* 606. *Texas Agr. Exp. Sta.*, 1942.) A comprehensive analysis is presented of the cotton-ginning business in Texas, with especial emphasis on costs and profits. It has been prepared primarily for students of the ginning business. The controlling influence of volume of ginning and investment in the gin plant on the cost and profit of ginning is analysed. The parts played by fixed cost and by variable cost in the cost and profit of ginning, the factors underlying the success of an individual ginner, and the fundamental aspects of a successful ginning business in Texas, are discussed.

367. TEXAS: MICROBIAL RESPONSES TO ORGANIC AMENDMENTS IN HOUSTON BLACK CLAY. By R. B. Mitchell *et al.* (*J. Agr. Res.*, **63**, 9, 1941, p. 527.) Curves for temperature, moisture, and microbial numbers were established for selected plots of Houston soil as a background for studies in cotton root rot control. As an environment for microbial activity the plots of Houston soil studied furnish the following striking features: In a period between early December and February the temperatures remained below those required for active microbial multiplication, yet without freezing. Temperatures ranged above 70° F. from March to November, and from 80° to 90° from June to October. Bacteria and actinomycetes are much more active and abundant than has been reported for northern soils. Maxima for total colony counts in soils receiving organic amendments reach 200 to 400 millions; actinomycetes at times reach 50 and 90 millions to the gram. Such responses to added organic nutrients present a challenge to the worker to search for organic media and agronomic practices capable of yielding a controlled microflora.

COTTON IN EGYPT.

368. EGYPTIAN COTTON: SPINNING QUALITY AND MARKETING. By H. A. Hancock. (*Text. Wkly.*, **29**, 1942, p. 262. From *J. Text. Inst.*, April, 1942, A166.) Prior to the collapse of France, cotton was moving out of Egypt at an unusually fast rate, but this movement stopped with the restriction on shipping, and the mere storing of cotton and seed has now become a problem. A British Government Cotton Buying Commission was set up which bought about 900,000 bales (of 733 lb.) amounting to about three-quarters of the 1940 crop, the rest being absorbed by export houses and local mills. About one-half of the supply was exported or consumed during the season, leaving a carry-over not so large as had been feared. The first official estimate of 1941 production was

1,110,000 bales, and the 1941-42 season opened with about 1½ times the normal supply of cotton in sight. The cotton stored in Egypt contains a high proportion of shorter-stapled varieties, more than three-quarters being Uppers or Zagora-Ashmouni. For the 1941-42 season a new buying commission has been set up jointly by the British and Egyptian Governments, buying at prices uniformly one penny per pound above the preceding prices for all grades. Legislation is in progress to restrict the acreage planted. An increase in the proportion of long-stapled cotton as a result of expansion of the growth of the new long-stapled variety, Karnak (Giza 29), is anticipated. Karnak is about the same quality as Sakel but gives a much higher yield and, because of its lower cost of production, is offered at a lower price than Sakel. Tables are given showing lea strength of 60's ring twist, staple length, hair weight per cm., relative price, 1941-42 supply, and maximum counts spinnable for different grades, for the various Egyptian cottons, including Karnak.

369. New Varieties of Cotton. By M. A. El-Kilani. (*Spec. Suppl. Egypt. Agr. Mag.*, 1941, p. 19. From *Pl. Bre. Abs.*, xii., **2**, 1942, p. 140.) The author, reviewing the work that has been done by the Plant Breeding Section on cotton improvement, outlines the methods used. The first is by selection within the prevailing varieties to produce new strains or varieties which exceed the originals in yield and quality. The second is by hybridization, natural or artificial, to develop new varieties which surpass the parents. Since the occurrence of natural hybridization is rare and its results are uncertain, the plant breeder relies on artificial hybridization to produce new varieties which combine the best qualities of the parents. The author continues by describing the new varieties produced by these two methods. Malaki, Karnak and Giza 36 were produced by artificial hybridization and Giza 31 by selection. However, these varieties are not yet on the market and are still under propagation. Malaki is a hybrid from Sakha 10 and Sakel, with staple length 39-40 mm., ginning outturn and yield equal to Sakel, fibre colour like Maarad, and remarkable spinning qualities; it is susceptible to wilt disease. Karnak is a hybrid from Maarad and Sakha 3 (selected from Sakel); fibre colour slightly dark, yield and ginning outturn higher than any other long-staple varieties, staple length 37 mm., resistant to wilt disease, and spinning qualities equal to those of Sakel. Giza 36 is a hybrid from Giza 12 and Sakha 3, combines high yield and high ginning outturn (10 per cent. higher than Sakel), staple length 36 mm., spinning quality as good as that of Sakel, and high immunity against wilt. Giza 31 was selected from Ashmouni, exceeds the latter in yield and fibre qualities and is early maturing and resistant to the high temperature of Upper Egypt.

COTTON IN OTHER FOREIGN COUNTRIES.

370. Argentina: La Determinacion de la Calidad del Algodon. By U. A. Verges. (*Bol. Mens.* No. 76, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 634.) Discusses the precautions necessary in picking and ginning to ensure good quality in cotton; the classification of cotton according to grade, staple length and character; the extraction of samples; the commercial classification of Argentine cotton and Argentine standards of grade; determination of the price of the fibre; disadvantages of selling as seed cotton; methods of marketing cotton fibre, and the utilization of fibre and seed products. The possibilities of cotton cultivation in Villa Dolores (Cordoba) are also discussed. The cotton of this region is stated to be of high grade and good character, with an average staple length of 26 mm. and a ginning outturn of 34·6. It is considered superior to most Argentine cottons.

371. Cotton Cultivation in Argentina (Roque Saenz Peña Presidency). By J. R. Báez. (*Bol. Mens.* No. 74, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 455. From *Summ. Curr. Lit.*, xxii., **5**, 1942, p. 110.) An account of the topographical features, vegetation, soil and climate of the Roque Saenz Pena Presidency which lies in the centre of the cotton-growing district of the Chaco. Temperature, rainfall, relative humidity, wind direction and other statistics for recent years are given. The cultivation of cotton in this region is discussed and the prevailing conditions are compared with the requirements of the cotton plant at each stage of its growth. Conditions are favourable but margins are not sufficiently ample to ensure that yields will always be high. Careful selection of types characterized by earliness and good yield is recommended. The varieties at present cultivated include the Chaco type and North American varieties such as Acala, Delta, Pine Land, Farm Relief, etc. The area under cotton in the Chaco has increased from 2,800 hectares in 1916-17 to 299,000 hectares in 1937-38.

372. Argentina: Cotton in Tucuman. By W. E. Cross. (*Mem. An. del año* 1940. From *Pl. Bre. Abs.*, xii., **2**, 1942, p. 108.) The most promising of the crosses appears to be Tucuman C1 × Acala Roger Improved. Improved selections have been obtained from Tucuman C1 and Lightning Express. The experiments on treating seeds with colchicine have been continued and the variety collection maintained.

373. Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, 1941.) *Bulls. Nos.* 75-80 (79 not received) contain the following among other articles in Spanish: "The history of cotton in Argentina"; "The prospects for Argentine cotton in the Spanish market" (C. M. Llerena); "Some aspects of agricultural mechanization" (T. Baranao); "Proposed establishment of an Insectarium (in Roque Saenz Pena Presidency) and its functions" (R. G. Mallo)—to study pink bollworm and to breed parasites for its control; "Ginning of cotton" (C. A. Padilla); "Preparation of the ground for cotton planting in the United States" (J. A. Llosa); "Disinfection of cotton seed" (R. G. Mallo); "The encouragement of cotton cultivation in Cordoba"; "The mechanization of cotton cultivation" (J. A. Llosa); "Visit to the Chaco of the Minister of Agriculture"; "Cotton diseases in the Argentine Republic" (M. Di Fonzo)—a well-illustrated paper dealing with cotton diseases and their control. *Bulls. Nos.* 81-2, 83-4, 1942, include the following among other papers in Spanish: "The cotton industry and its influence on national economic development" (A. Dorfman); "The treatment of cotton seed with various anticryptogamic products" (M. Di Fonzo); "Insecticides for pink bollworm control" (A. S. Chapman and W. L. Lowry); "Notes on parasites of the cotton pests *Alabama argillacea* and *Platydra gossypiella*" (P. C. L. Demer). Statistics are also included of acreage, production, prices, exports, etc.

374. Brazil: Cotton Industry, 1941-42. (*S. Amer. Jour.*, 15/8/42.) The first official estimate for the 1941-42 cotton crop of southern Brazil is approximately 342,000 tons. The quality of the current crop of São Paulo has suffered from excessive rains during the maturing and picking seasons. The third official estimate of 1941-42 production in northern Brazil is given as 107,148 tons. This crop was damaged by dry weather and is much below the previous season's output. The marketing prospects are uncertain because of the limited number of export markets, the shipping situation, and the prospective large surplus of low-grade cotton. The loss of the Far Eastern markets constitutes the greatest problem.

375. GUATEMALA: COTTON INDUSTRY, 1940-41. (*U.S. Dpt. Com., For. Com. Wkly.*, 18/4/42. From *Cott. Lit.*, May, 1942, p. 169.) The 1940-41 crop was estimated at 51,824 quintals of 101·43 lb. each, which represents approximately 1,500,000 lb. ginned cotton. The demand for cotton far exceeds the local supply, and imports during 1941 were officially stated as 596,733 kg. from the United States, El Salvador, Peru, Honduras, and Nicaragua.

376. HAITI: COTTON CULTIVATION. (*Rapp. Ann. Exer.* 1936-37 *et* 1937-38. From *Pl. Bre. Abs.*, xii., **2**, 1942, p. 106.) The opinion is expressed that for conditions in Haiti it is essential to obtain by selection a type of indigenous cotton much smaller than the existing ones, and characterized by rapid and uniform vegetative development and fruiting in order to combat the two weevils which attack annual cotton.

377. SOIL CONSERVATION IN PUERTO RICO. By E. Harrison. (*Trop. Agr.*, March, 1942, p. 54.) A note describing some of the work carried out by the U.S. Soil Conservation Service in Puerto Rico to conserve the soil by means of contour furrows, terracing, drainage channels, and the planting of molasses grass and other grasses.

378. SPAIN: COTTON INDUSTRY, 1941. (*U.S. Dpt. Agr., For. Agr. Relns., For. Crops and Markets*, January, 1942, p. 8. From *Cott. Lit.*, March, 1942, p. 113.) Favourable weather conditions enabled Spanish farmers to obtain a good yield of high-grade fibre from the 1941 harvest. An unofficial estimate, based on ginnings to the end of November, indicated that the crop amounted to about 11,000 bales from 46,800 acres, compared with 7,700 bales from 39,600 acres in 1940. The Spanish Government, through its Institute for the Increase of Cotton Cultivation, is encouraging greater cotton production by payment of bounties and high fixed prices. The bounty paid under specified conditions on the 1941 crop amounted to 0·50 peseta per kilogram (2·07 cents per pound). Prices paid to growers were fixed at 3·30 pesetas (13·67 cents), 2·70 pesetas (11·18 cents), and 2·10 pesetas (8·70 cents) for cotton of the first, second, and third classes respectively.

SOILS, SOIL EROSION, AND MANURES.

379. SOIL PHYSICS: THEORY AND PRACTICE. By Dr. B. A. Keen, F.R.S. (*J. Roy. Soc. of Arts*, xc., 4618, pp. 545-79, July, 1942.) Three Cantor lectures delivered to the Royal Society of Arts by the Assistant Director of the Rothamsted Experimental Station. The main theme of the first lecture is the structure of the soil in relation to its water content. After describing various physical methods of examining samples of soil the lecturer emphasized that many of these necessitate the breaking down of the natural crumb structure, so that the main characteristic of field soil is destroyed. "The crumbs are aggregates of individual clay particles in which some inert and larger particles may be enmeshed, and they are permeated by minute interstices. Between the crumbs there are larger pore spaces. Thus the soil interstices consist in essentials of a micro-pore-space in the crumbs and a macro-pore-space between them. In this pore-space water moves or is retained under the influence of gravity, evaporation, and absorption by plant roots; within it also the soil air which is richer in carbon dioxide interdiffuses with the outside atmosphere." The capillary tube hypothesis of water movement in the soil assumed that water could rise from a deep water table to supply deficiencies in the upper layers, and has been long used to provide a scientific explanation of the effects of certain agricultural practices. Experimental investigation has consistently failed to justify the hypothesis, and work at Rothamsted has provided another explanation, based on the pore-space distribution. The general effect of

this theory is that water movement is as far as possible localized within the cells between the particles of soil and is thus highly resistant to external change. The consequences of this passive rather than active rôle are seen in irrigation and in drainage. The effect of irrigation is not a uniform distribution of water through the soil, but the saturation of the soil in the immediate area of application, followed by a wider distribution which takes place much more slowly and results in a moisture content appreciably less. In land drainage there has been much preoccupation with the position of the water table. From present knowledge, if this is lower than 8 ft. it is incapable of supplying water to the crops above it. If it is higher than this damage may well be avoided by reducing it.

The second lecture applies the pore-space theory to the consideration of soil tilth and methods of cultivation. A soil in good tilth is one with a definite crumb structure, and the nature and formation of this structure is examined in detail. There is some way to go before a complete scientific explanation of the forces at work can be given, and until then soil tillage will remain more of an art than a science. Cultivation implements have little direct control over tilth production. Their main function is to leave the soil in the best condition for the weather to act, or, conversely, to complete the effects of the weather. The effects of the plough and of the rotary cultivator are compared, and it is shown that the common belief that the latter gives a superior tilth is a fallacy. The development of plough design is considered at some length. In considering the effects of hoeing and harrowing, traditionally explained as the interruption of the capillary tubes leading water to the surface, it is pointed out that the majority of soils are self-mulching—*i.e.*, they automatically form a dry surface layer during periods of sustained evaporation. Actually the primary function of hoeing is held to be the destruction of weeds, and a secondary function of hoeing and harrowing is to break up the crust which forms on some soils and to prevent the opening of large cracks. Surface cultivation may perhaps encourage deeper rooting by destroying roots near the surface. The effect of rolling is to compress the soil around the roots of the young plants.

The third lecture discusses the relation between cultivation and yield. The results of experiments carried out for 12 years at Rothamsted, begun in the full belief that they would confirm the ideas of practical men as to its benefits, have in fact shown that yields are remarkably insensitive to variations in cultivation. (*a*) *Subsoiling* . this, whether done by plough or hand-forking, had no beneficial effect on sugar beet. (*b*) *Extra ploughing :* the double operation of autumn and spring ploughing, compared with autumn ploughing for beet and spring ploughing for potatoes, while it appeared to give a small increase in yield, was unprofitable. (*c*) *Depth of ploughing :* results, averaged over 6 years, comparing the effects of deep and shallow ploughing on the yield of wheat, barley and mangolds, show differences which, though in favour of deep ploughing, only reached significance in the case of mangold roots. The conclusion is that on this land shallow ploughing is, on the average, as effective as deep ploughing. Other experiments dealt with ploughing and grubbing, rotary tillage, and rolling. The results of a variety of cultivation experiments " lend no support to the idea that extra cultivations increase crop yield; they show that, provided (*a*) a reasonable seed-bed is obtained, (*b*) weed competition is prevented during the early growth of the crop, and (*c*) the worst of the weeds are kept down afterwards, then any work in excess is wasted, and may even be harmful, so far as the crop yield is concerned. On the other hand, they do emphasize the importance of choosing the right time for cultivations."

380. Factors Affecting the Formation of Soil Crusts. (*Br. Chem. Phys. Abstrs. B. III*, p. 313. From *Trop. Agr.*, August, 1942, p. 164.) A main factor

in crust formation is the presence of fine particles greater than 0·01 mm. in diameter. Crusts are formed on structureless fine-grained soils possessing plasticity when wet. Salts in the soil solution are not important in crust formation. Although they cause a disaggregation of micro-aggregates this has little effect on the final setting of the soil. The greater the number of fine particles in the soil and the slower the movement of water in the capillaries during evaporation the more marked is the difference in the moisture of contiguous soil layers, this being the principal cause of cracks appearing on the surface of the soil. The quantity and quality of the humus are important, but in structureless fine-grained soils crusts are formed regardless of the humus content.

381. An Important Effect of Soil Colloids on Plant Growth. By J. S. Papadakis. (*Soil Sci.*, **52**, 4, 1941, p. 283. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 25.) Culture solutions in which roots had been grown were found deleterious to other plants, and increasing the number of plants growing in a solution decreased the yield. These effects were experimentally shown not to be attributable to exhaustion of nutrients. Experiments with mixtures of fine gravel and fine soil showed that plant yields increased considerably when the proportion of fine materials increased, the increment being greater with high levels of nutrients or moisture than with low levels. The effect of increasing the proportion of fine soil, though slight at the beginning, became more and more pronounced as growth advanced. As an explanation of these observations the author holds that soil colloids absorb the living root toxins and aid in their oxidation, and that, in addition to their influence on the chemical and physical properties of the soil, soil colloids increase the available space. With the highest levels of nitrogen, phosphorus and water, the yield increased in the corn experiment from 3·78 to 27·26 gm. per pot when the proportion of fine soil increased from 10 to 40 per cent.

382. The Measurement of Structural Stability and Permeability and the Influence of Soil Treatments upon these Properties. By R. B. Alderfer and F. G. Merkle. (*Soil Sci.*, 51, 1941, p. 201. From *Trop. Agr.*, February, 1942, p. 38.) A method is described which is sufficiently refined to reveal the small alterations in aggregate size and stability that may be produced within a single soil type by different soil treatments through variations in cultural practice, fertilization, erosion, etc. A numerical measure of the structural stability of the aggregates and the probable permeability of soils is presented. When the method was used to study differences in structure and permeability produced by cropping systems, fertilizing, and liming, it was shown that on a single soil—(*a*) a rotation of corn, oats, wheat and clover over a period of 58 years caused a breakdown of aggregates as compared with sod land adjacent; (*b*) a vegetable cropping system including no sod crop, and with cover crops only for soil improvement, produced after 21 years a poorer structural condition than the rotation described in (*a*); (*c*) farm manure whenever used produced definite physical improvement; (*d*) liming did not significantly alter the structural condition; (*e*) other things being equal, structural stability is closely correlated with the organic content; (*f*) the volume weight exhibits a significant inverse relationship with structural stability, probable permeability, and organic content.

383. Effect of Structure of Artificial Rain on Character of the Moistening and on the Agro-Physical Properties of the Soil. (*Br. Chem. Phys. Abstrs. B. III*, p. 310. From *Trop. Agr.*, August, 1942, p. 164.) Intensification of the spray when using sprinkling irrigation destroys soil structure, decreases depth of water penetration, and increases run-off. Increasing the size of drops in the spray also increases the destructive effect on soil structure. The optimum intensity of spray is 0·2 mm./min., at which rate no destruction of soil

structure takes place, but small aggregates are formed and a maximum depth of penetration results. The optimum diameter for the drops in the spray was 2-3 mm.

384. Soil Conservation and Land Use Studies. (*U.S. Dept. Agr., Sec. Agr. Rpt.*, 1941, p. 176. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 744.) This report takes up the great costs incurred through soil losses, the preparation of land-use-capability maps, and tillage by conservational methods. Control of floods by land treatments is also dealt with, an appraisal of benefits is made, and the national defence aspect is discussed.

385. Dispersion Studies on Gezira Soil. By T. N. Jewitt. (*J. Agr. Sci.* [England], **31**, 4, 1941, p. 466. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 745.) The relation of initial moisture content to the degree of dispersion on shaking of the heavy clay Gezira soil is given. A minimum dispersibility was found at about 7 per cent. of initial moisture content. The relation between dispersion and water content is discussed in connection with possible effects in field practice.

386. Measures and Practices for Controlling Erosion and Conserving Water. By C. R. Enlow. (*Monthly Bull. Agr. Sci. and Prac.*, xxxii., **12**, Rome, 1941, p. 379T.) The paper describes the manner in which various conservation measures are applied to individual farms in the work of the U.S. Soil Conservation Service. The technique has been developed by applying research results and by evaluating conservation measures in operation during the past 8 years. The paper discusses the necessity of securing information on the physical resources of each farm, the classification of the land as suitable, or unsuitable, for cultivation, and the question of farm planning. A list is given of some thirty measures and practices of value in conserving soil and water.

387. Soil Erosion in China. By T. M. Tieh. (*Geog. Rev.*, **31**, 4, 1941, p. 570. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 745.) Discusses climate, soils, and vegetative cover, and the extent of soil erosion and its control.

388. Influence of Micro-organisms on Soil Aggregation and Erosion. II. By J. P. Martin and S. A. Waksman. (*Soil Sci.*, **52**, 5, 1941, p. 381. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 28.) The action of micro-organisms in Bermudian clay loam and Collington sandy loam was found, in a continuation of previous work, to result in a marked aggregation of the soil particles. The extent of aggregation depended upon the nature of the organic and inorganic materials added. Alfalfa and straw were more effective than manure, which, in turn, was more effective than peat or lignin in establishing aggregates. Complex organic materials, together with lime, maintained a better state of aggregation of the clay-loam soil than did the organic substances alone. Lime alone exerted a small and gradually increasing effect upon the silt and clay particles of the moist soil. This effect was not so apparent after the soil was dried. The dried soil receiving lime showed an increase in the percentage of very small aggregates only. Lignin and casein together produced greater aggregation in the clay soil than did casein alone, as determined by tests on the moist soil. After the soil was dried, the effects of casein alone appeared to be greater than the effects of casein and lignin used in combination.

[*Cf.* Abstr. **361**, Vol. XVIII. of this Review.)

389. A Convenient Soil-Culture Method for Obtaining Sclerotia of the Cotton Root Rot Fungus. By A. A. Dunlap. (*Amer. J. Bot.*, **28**, 1941, p. 945. From *Circ.* 96, p. 25. Texas Agr. Exp. Sta., 1942.) Sclerotia of the cotton root rot fungus, *Phymatotrichum omnivorum*, have been consistently obtained in sterile-soil cultures with a nutrient added, such as seeds of sorghum,

cotton, bean, or cowpea. This method has been found effective under a wide range of moisture, nutrient, temperature and soil conditions. Variations in size of sclerotial masses were noted with different types of nutrients and when sand was used in place of soil.

390. Soil and Fertilizer Investigations of the Bureau of Plant Industry. (*U.S. Dpt. Agr., Bur. Pl. Indus. Rpt.*, 1941. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 740.) Fertilizer research is reported on the following: The production of phosphate fertilizer and hydrogen for ammonia by the substitution of steam for air in blast-furnace methods for treating phosphate rock, the development of a method of granulation of potassium chloride, and the status of the use of mixed and high analysis fertilizers. (R. O. E. Davis.) Soil chemistry investigations are reported as follows: The boron content of different soils throughout the United States, a method for the determination of fluorine in soils, and the possibility of the use of hickory leaves as an indicator plant to determine the availability of certain trace elements. (H. G. Byers.) Soil microbiology investigations are reported on the inoculation of winter legumes and the effect of certain minor elements on nitrogen fixation. (C. Thom.)

391. Conserving Soil and Water with Stubble Mulch. By H. H. Bennett. (*Agr. Eng.*, **23**, 2, 1942, p. 37. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 122.) "Stubble mulch" is defined as a process of protecting cultivated or bare land in such a way as to conserve soil and soil moisture and reduce evaporation through the use of a complete or partial surface covering composed of some form of crop stubble or residue. The primary process consists in merely stirring the soil with ploughs without mouldboards. It leaves much of the vegetative material—crop residue or vegetative litter—on the land as a surface protection against erosion. Comparing this treatment with that of basin listing, the author cites the observation at Lincoln, Nebraska, that applying 2 tons of wheat straw per acre and ploughing with a blade or winged implement a few inches beneath the surface, without turning the straw under, conserved 54 per cent. of the rainfall. Under comparable or duplicate conditions, only 20·7 per cent. of the rainfall was conserved with ordinary summer fallow, and only 27·7 per cent. with basin listing, even though the basin listing permitted virtually no run-off, since the losses due to evaporation from the convoluted bare surface tended to offset the gains due to prevention of run-off.

392. The Utilization by Cotton of the Nutrient Substances in Fertilizers. (*Chem. of Soc. Agr.*, No. 6, 1940. In Russian. From *Cott. Lit.*, February, 1942, p. 39.) In a series of 4-year experiments applied N was utilized to the extent of 30-100 per cent., applied P 15-30 per cent., applied K 70-80 per cent. Mineral N was utilized more fully than organic N; P from farmyard manure was more fully utilized than mineral P. A combination of organic and mineral fertilizers is recommended.

393. Studies on Physico-Chemical Changes in Black Cotton Soil during Nitrification. By M. Prasad and N. K. Patwardhan. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 978.) A study of some properties of the black cotton soil as nitrification proceeds in the untreated soil and in soil treated with two different doses of ammonium sulphate. The experiments were conducted at the Indore Institute of Plant Industry for a period of four months, during the Bombay monsoon. Trays containing untreated soil and soil treated with 25 lb. and 50 lb. of N-equivalent of ammonium sulphate (Merck's A.R. quality) per acre of 6 inches deep soil, were arranged in two well-ventilated chambers with glass doors. Samples (12 at a time) were withdrawn and analysed every month for ammoniacal nitrogen, nitrate nitrogen, organic carbon, C/N ratio, and hygroscopic moisture;

and every two months for base exchange capacity, total and individual replaceable bases, available phosphoric acid (P_2O_5), aggregate analysis and resistance to water (structure coefficient). The results, which are tabulated and discussed, show that many of the improvements in the soil properties take place during the first two months after the treatment. Thus, the amount of nitrate supposed to have an adverse effect on soil is least in this period, and increases only after three months from the start. The ammoniacal nitrogen is in equilibrium with the nitrate nitrogen. The organic carbon increases during the first two months as a result of the formation of algæ. The C/N ratio remains fairly steady and the available P_2O_5 content does not appear to have any correlation with the nitrate nitrogen. Base exchange capacity, total exchangeable bases and the exchangeable calcium increase in the first two months and then decrease. Replaceable sodium and potassium decrease both with the treatment and time, while exchangeable magnesium decreases only with time and not with the treatment. The hygroscopic moisture increases in the first two months, but treatment with ammonium sulphate produces no changes in the clay content of the soil or in the structure coefficients. To sum up, the application of ammonium sulphate in doses used in the experiment increases soil fertility and productivity and causes no deterioration in the soil structure of a permanent nature.

394. Ant Heaps as Fertilizer. (*Crown Col.*, September, 1942, p. 568.) Describes a unique method of maintaining soil fertility, practised by the inhabitants of a village in the Minna Division of the Niger Province, which was encountered by an officer of the Nigerian Forestry Department. Writing in *Farm and Forest* he says that in addition to rotating crops and arranging annually for Fulani to kraal on their land, the farmers used termite mounds. The red ant heaps are turned over and exposed to the sun to drive out the ants. They are then pulverized and scattered over the ground. These ant heaps, the farmers maintained, helped in manuring the land. The farm examined, some 50 acres in extent, had been under continuous cultivation for 15 years, yielding good crops of guinea corn, hungry rice, maize and groundnuts. The soil showed no signs of exhaustion.

395. Cotton Plant: Response to Phosphatic Manures. By W. B. Andrews. (*J. Assoc. Offic. Agr. Chem.*, 25, 1942, p. 498. From *Summ. Curr. Lit.*, xxii., 15, 1942, p. 343.) Since 1928 much use has been made of superphosphate manures that have been "ammoniated" to various nitrogen contents. There is some evidence that official analytical methods for evaluating phosphatic manures undervalue these ammoniated products, and the present paper is a critical enquiry into the question. For the cotton grower its chief interest lies in the results of many manuring experiments in different parts of the American Cotton Belt, and especially in a table that gives the average increase in yield of seed cotton produced on soils of different types by superphosphate, various ammoniated superphosphates, tricalcium phosphate, and mixtures with marble or dolomite dust.

396. A Review of the Manurial Experiments with Cotton in India with Suggestions for the Future. By D. V. Bal. (C.P. and Berar.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 107.) The specific needs of the various soils having been determined some general questions are suggested for investigation.

397. A Note on Cotton Manuring Trials in India. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 108.) A general discussion of the subject, inviting the co-operation of research workers in the planning of

manurial trials. Previous results require confirmation by a new series of well-planned trials capable of being examined by proper statistical methods.

398. COMPOST AND THE COTTON CROP. By A. Sreenivasan. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 118.) From experiments made at Indore since 1932 with compost and inorganic fertilizers the general experience has been that on rich and well-drained fields and in fields protected from erosion the latter always increased the yield of cotton profitably and compost seldom, while on fields of opposite character treatment with compost was beneficial and inorganics either failed altogether or were unprofitable. Composts cannot properly be compared with artificials for the reason that the former act predominantly as suppliers of humus and only incidentally as sources of plant nutrients. Their functions are really complementary. The residual effect of compost is always very marked.

399. KRAAL COMPOST. By S. D. Timson. (*Rhod. Agr. J.*, May-June, 1942, p. 161.) A general description of the method of making compost and of the raw materials required.

400. THE CHEMISTRY AND TOXICITY OF SELENIUM COMPOUNDS, WITH SPECIAL REFERENCE TO THE SELENIUM PROBLEM. By E. P. Painter. (*Chem. Rev.*, **28**, 2, 1941, p. 179. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 727.) A critical survey of the literature through 1940 on organic selenium compounds and their toxicity, with especial reference to the nature of the form in which selenium occurs in seleniferous plants and grains. The subject-matter is discussed under the four headings: the selenium problem in agriculture, methods of analysis, organic compounds of selenium, and the properties of selenium in plants and their relation to known compounds of selenium and sulphur. 186 references are appended.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

401. THE RELATION BETWEEN THE DESIGN OF AN EXPERIMENT AND THE ANALYSIS OF VARIANCE. By A. E. Brandt. (*J. Amer. Statist. Ass.*, 36, 1941, p. 283. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 165.) With the modern development of design of field experiments the analysis of variance has become of a more complex character. In such experiments a large number of treatments are tested simultaneously and the analysis of, say, yields from such experiments should produce estimates of yield increase for each of the treatments tested. These estimates of what are called " individual treatment effects " are the basic idea of the analysis of variance of modern designs as developed by Fisher and Yates. The author shows how the idea may be extended, and produces a general scheme for the computation of all " effects " in a general analysis of variance. Although the method is cumbersome where large-scale experiments are to be analysed, it is instructive and self-checking. It should also be of interest to those concerned with mechanical methods of computing.

[*Cf.* Abstrs. **97**, Vol. XIII., **463**, Vol. XIV., and **101**, Vol. XV. of this Review.]

402. STUDIES IN THE TECHNIQUE OF FIELD EXPERIMENTS. V. SIZE AND SHAPE OF BLOCKS AND ARRANGEMENT OF PLOTS IN COTTON TRIALS. By V. G. Panse. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 850.) The relation between block size and experimental error is important in planning agricultural trials. A uniformity trial on Malvi cotton was examined to study the question by combining plots of $\frac{1}{50}$, $\frac{1}{100}$, $\frac{1}{200}$ and $\frac{1}{500}$ acre size into blocks of varying sizes. There is a general decrease of block efficiency with increasing block size. More compact blocks of the same size show a higher efficiency. Blocks of identical size and shape but

consisting of long plots also show a somewhat higher efficiency than blocks with short plots of the same size. Arrangement of plots in more than one row decreases block efficiency and the effect is more pronounced with long plots. A logarithmic relationship is shown to exist between block efficiency and experimental error; but larger and longer plots give a lower error irrespective of block efficiency. In determining experimental error plot size and shape are therefore of greater importance than block efficiency. The number of replications and total area of land required to give a 4 per cent. error of the mean were calculated. For the same number of plots per block, smaller plots require more replication but less total area than larger plots. With all plot sizes except the largest, and with 16 or more plots to a replicate, there is a gain in efficiency by confounding; but a quasi-factorial arrangement for only 16 varieties was found less efficient than simple randomized blocks. Factors influencing the choice of design for agronomic and varietal trials of different sizes are discussed.

[*Cf.* Abstrs. **264, 449**, Vol. XIII. of this Review.]

403. TETRACHLORO-PARA-BENZOQUINONE, AN EFFECTIVE ORGANIC SEED PROTECTANT. By E. L. Felix. (Abstr. in *Phytopathology*, xxxii., 1, 1942, p. 4. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 298.) Damping-off of cotton (*Pythium* spp., *Corticium solani*, and other fungi) was effectively combated in flats of Mississippi cotton soil by the treatment of machine-delinted seed at the rate of 3 oz. undiluted or 4-6 oz. 25 per cent. Spergon in talc per bushel of seed. Spergon is a commercial preparation containing 99 per cent. tetrachloro-para-benzoquinone as the active ingredient.

404. FACTORS AFFECTING THE LONGEVITY OF COTTONSEED. By D. M. Simpson. (*J. Agr. Res.*, **64**, 7, 1942, p. 407.) The longevity of cottonseed is definitely dependent upon the moisture content of the seeds and the temperature conditions under which the seeds are stored. The studies here reported deal with the effects of moisture alone under "normal" storage temperatures and with the combined effects of controlled moisture-temperature conditions. In ordinary storage, seeds quickly reach a moisture content in equilibrium with that of the storage environment. In storage experiments with Upland and Sea Island cotton seed under the humid and fairly high temperature conditions prevailing near Charleston, South Carolina, seeds in bags deteriorated rapidly after 2 years, but seeds with a moisture content reduced below 8 per cent., and stored in tin containers to prevent the rapid reabsorption of moisture, retained their viability with only slight impairment for 7 years, and a few seeds were still germinable after 10 years' storage. Lots of Upland and Sea Island cottonseed sealed in glass jars and containing 11 per cent. moisture were worthless for planting purposes after 2 years' storage, but other lots, especially of the Sea Island seeds, containing 6 and 8 per cent. moisture, showed a high percentage of viable seeds after 7½ years' storage. Thus, cottonseed containing less than 8 per cent. moisture apparently does not require aeration and can be kept viable for many years in airtight containers even at the temperatures that prevail along the Coastal Plain. Cottonseed of two Upland varieties was adjusted to several levels of moisture ranging from 7 to 14 per cent. and stored at constant temperatures of 90°, 70°, and 33° F. Corresponding checks were subjected to normal fluctuating temperatures at Knoxville, Tennessee. The seeds stored at 90° deteriorated rapidly, those containing 14 per cent. moisture were all dead in 4 months, and after 36 months' storage only those seeds with 7 per cent. moisture were germinable, and their viability was impaired. In contrast, seeds stored at 33°, even with 14 per cent. moisture, retained their viability for 36 months without appreciable impairment. Seeds stored at air temperature and at 70° were somewhat intermediate with respect to moisture tolerance. The higher moisture lots deteriorated less

rapidly at 70° than at air temperature. If the moisture content is low cotton seeds can withstand high temperatures without rapid deterioration, and if the temperature is kept low they are tolerant of high moisture, but both temperature and moisture cannot be high if rapid deterioration is to be prevented. In field germination tests, the percentage of seedling mortality was greater from seeds stored at 33° F. than from seeds stored at higher temperatures. Apparently the low storage temperature was also favourable for the survival of anthracnose spores on the seeds. Analyses of stored seeds showed that with increased seed moisture or increased storage temperature there was a corresponding increase in the percentage of free fatty acids in the oil.

405. COTTONSEED: QUALITY TESTING. By N. Reichart. (*Bol. Mens.* No. 73, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 390. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 110.) An account of Simpson's work on the influence of climatic conditions and of storage on the viability of cottonseed, and of Meloy's studies of quality based on determinations of the free fatty acid content of seeds. It is recommended that tests of germinating power should be accompanied by determinations of moisture content, and that seed containing more than 12 per cent. of moisture should be discarded since it will deteriorate on storing. The Simpson and Chester techniques for the determination of germinating power are outlined.

[*Cf.* Abstrs. **582**, **583**, Vol. XII., and **106**, Vol. XIII. of this Review.]

406. LA BATATA COMO CULTIVO SUCESIVO AL ALGODON. By E. Molinary Salés. (*Agr. Exp.* [*Puerto Rico Univ. Sta.*], **1**, 5, 1941, p. 6. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 621.) The sweet potato, especially the Don Juan variety, is indicated as a good crop to follow Sea Island cotton because of rapid growth and response to fertilizer residues left by the cotton. Since the sweet potato belongs to a family unrelated to cotton, it would not be liable to introduce certain insects and diseases into the rotation.

407. COTTON-PICKING MACHINE. International Harvester Co., New Jersey. (U.S.P. 2,247,686. From *J. Text. Inst.*, April, 1942, A169.) A cotton-picking machine has rotatable conical spindles tilted at an angle such that one end of each moves through a plane, and formed with steep spiral rows of teeth set at a small angle to the axis of the spindles. A circular doffer is arranged so that it makes contact with the teeth on the spindles from the outer end towards the base and substantially parallel to the row of teeth.

408. COTTON-PICKING MACHINE DOFFING UNIT. International Harvester Co., New Jersey. (U.S.P. 2,247,682. From *J. Text. Inst.*, April, 1942, A168.) A doffing unit for a cotton picker of the rotating spindle type comprises a disc-like support carrying a number of lugs projecting at the circumference, a doffer element consisting of resilient material that fits over the lugs and is joined up by a web, and an annular securing element having projections fitting against the web connecting portions between the lugs.

409. THE WORK OF THE UNITED STATES COTTON GINNING LABORATORY. (*U.S. Dpt. Agr., Misc. Pub.* 445, 1941, p. 28. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 539.) This is mainly a popular account of the purpose, equipment, and accomplished work of the ginning laboratory at Stoneville, Miss. The study of the cotton before ginning has shown that trash brought in by careless picking may cause losses as much as $5 per bale, and that the most complete cleaning equipment does not entirely offset the results of careless picking. Development of mechanical driers which increase the value of the ginned lint by from 70 c. to $2.50, according to staple length, at a fuel cost often less than 15 c. per bale, is mentioned, together with increases up to nearly 20 per cent. in gin capacity brought about by raising saw speeds from 400 to 600 r.p.m. at a cost negligible in comparison with the gain

in value of the cotton gin which may be obtained from this change and from the concomitant use of looser seed rolls. Study of the effects of variations in gin-saw design and the importance to proper doffing of keeping the brush drums and brushes in good repair are also taken up, as are packaging improvements, pure-seed handling equipment, reduction in power wastes, etc.

410. Cotton from Boll to Bale. By F. L. Gerdes *et al.* (*U.S. Dpt. Agr., Leaflet* 211, 1941. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 471.) The harvesting and handling practices described, and considered essential in producing maximum values of ginned lint and seed, include picking dry or drying after picking, picking clean and before undue field exposure, keeping separate (or thoroughly mixing) seed of unlike quality, bringing in loads of seed cotton to produce bales weighing about 500 lb., use of modern gin equipment, and careful handling and storage of baled cotton.

411. Cotton Ginning Improvements in 1941. By F. L. Gerdes. (*Cott. Ginners' Jour.*, March, 1942. From *Cott. Lit.*, April, 1942, p. 123.) Brief report of new gin installations in the United States. A table is included showing the number of cotton gins in the United States equipped with driers from 1935 to 1941.

412. Cotton Gins: Power Requirements. By V. L. Stredousky *et al.* (*U.S. Dpt. Agr. Circ. No.* 60, 1941. From *Summ. Curr. Lit.*, xxii., 12, 1942, p. 272.) With the aim of reducing the waste of power in driving cotton gins, a power survey has been made at 63 representative ginneries in the Yazoo-Mississippi Delta. This survey showed that on the average about 40 per cent. of the power used for ginning was consumed by fans and 60 per cent. by the stands, separators, feeders, cleaners, presses and other equipment. The average fan in a gin required horse-power per stand as follows: air-blast fans, 4·7; suction and seed-blowing fans, 5·7; standard suction fans, 4·6; Rembert type unloading fans, 5·3; seed-blowing fans, 3; drier fans, 3·6; and hull fans, 1·3. Means by which ginners can effect savings in power are discussed.

413. Effect of Cottonseed Disinfection on Yield. By J. F. Dastur. (*Ind. Jour. Agr. Sci.*, xii., 11, 1942, p. 364.) Experiments carried out over several years on various government farms in India indicate that the chemical treatment of cottonseed increases the yields of seed cotton. The percentage increase in yield at each station is shown by means of tables. Treatment of seed with fungicides also aids in the control of anthracnose and other fungus diseases. Good results were obtained with Agrosan G.

414. Conditioning Cottonseed. By L. Volkobrun. (*Masloboino-Zhirovaia Promshlennost*, No. 5/6, 1940. In Russian. From *Cott. Lit.*, April, 1942, p. 141.) Conditioned cottonseed yields better and more uniform oil than seed varying widely in moisture content. A method is described for humidifying seed to 10 to 11 per cent. moisture content. Moisture distribution measurements show considerable fluctuation, with 9 to 32 per cent. of total moisture contained in the hulls and 68 to 91 per cent. in the seed itself.

415. Estimation of Gossypol in Crude Cottonseed Oil. By J. O. Halverson and F. H. Smith. (*Indus. and Eng. Chem., Analyt. Ed.*, **13**, 1, 1941, p. 46. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 734.) Precipitation as dianilinogossypol dipyridine is expedited by increased temperature, by the addition of gossypol in an ether-extracted oil prepared from cottonseed meats, and by constant agitation, which precipitates the gossypol in a good crystalline condition for rapid filtration and washing without appreciable loss due to dissolving. Solubility is prevented by the use of pyridine in the wash solution. The gossypol compound is prevented from adhering to the glass container by the elimination of practically all water. Recovery of added gossypol and the reproducibility of results are good.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

416. Resistance of Plants to Insect Attack. By R. O. Snelling. (*Bot. Rev.*, 7, 1941, p. 543. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) This appears to be a very comprehensive review. There are 567 references in the bibliography. The word " resistance " is used in its widest sense and includes those characteristics which enable a plant to avoid, tolerate or recover from the attacks of insects under conditions that would cause greater injury to other plants of the same species. The review is divided into four parts—introduction, records and importance of host resistance, plant characteristics suggested as having an influence in resisting insect attack, and breeding plants to reduce insect damage. There are three tables—records of insect resistance, plant characteristics suggested as having an influence in resisting insect attack, and records of accomplishments in breeding plants for insect resistance.

417. The Economic Value and Biological Significance of Insect Resistance in Plants. By R. H. Painter. (*J. Econ. Ent.*, 34, 1941, p. 358. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) In this general review the following topics are discussed: resistant varieties as a principal control method; as an adjunct to other methods; in relation to the general population level of the insect involved; in relation to insect hyperparasitism; and in relation to chemical control. The interrelations of factors affecting insect resistance in plants are considered in terms of the three characteristics—preference, antibiosis (adverse effect on the biology of the insect), and tolerance. Finally, the problem of permanence of resistance and the evolutionary importance of insect resistance are considered.

418. Insects and the Spread of Plant Diseases. By W. Carter. (*Rpt. Smithson. Instn.*, 1940, p. 329. Washington, D.C., 1941. From *Rev. App. Ent.*, xxx., Ser. A, 1942, p. 386.) The author discusses the ways in which insects spread plant diseases by carrying on or in their bodies the spores of fungi and bacteria, with which they contaminate blossoms or wounds of the plant, by injecting injurious fluids into the plants in the course of feeding, or by transmitting viruses from diseased to healthy plants, and the effect of climate on these activities. He points out that the occurrence of insect-transmitted diseases of plants is world-wide, and gives a brief account of some of the control measures now in use and the probable lines of development in this field in the future.

419. Studies of Insect Damage to Cotton with reference to Soil-Conservation Practices. By P. A. Glick and K. P. Ewing. (*J. Econ. Ent.*, 34, 6, p. 737. Wisconsin, 1941. From *Rev. App. Ent.*, xxx., Ser. A, 9, 1942, p. 428.) An account of studies being made to determine the effect of the latest farming and soil-conservation practices in the Blacklands of Texas on insects injurious to cotton. The plan of operation, the records made, the scope of the insect studies and methods of making population counts of the different insects are described. Detailed seasonal infestation records are being made of cutworms, cotton aphid, thrips, cotton flea hopper, boll weevil, bollworm, cotton leafworm, fall armyworm, and Pentatomids, together with records of unusual outbreaks of other cotton pests. The survey has been in operation for only 2 years, and no trends are so far evident; it is anticipated that the work will not be completed for at least 9 or 10 years.

420. Resultados de la Experimentacion de Tratamientos contra las Plagas Animales del Algodonero. By H. Muñoz Pinochet and S. Tessi Seitún. (*Bol. Mens.* No. 75, *Junta Nac. del Algodon.* Buenos Aires, 1941, p. 580. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 314.) This is a review of the results obtained in experiments in 1939-40 in the Chaco Territory of Argentina on the

use of sprays and dusts against pests of cotton. Highly satisfactory control of the larvæ of *Alabama argillacea* Hb., without any injury to the plants, was given by "Larval" (an official insecticide containing 40 per cent. arsenic trioxide and 22 per cent. sodium hydroxide) applied at a concentration of 0·15 per cent. with the addition of 5 per cent. prickly-pear mucilage, and at the rate of 22 gals. per acre. The mucilage is prepared by macerating 30 lb. finely chopped pads of *Opuntia tuna* in 10 gals. water for 24 hours and straining. The spray should be made up on the day of application, and the amounts stated should not be exceeded or scorching may occur. The mucilage can be replaced by other adhesives, such as 5 per cent. molasses. Good results were also given by sprays of Paris green, calcium arsenate and lead arsenate, but no minimum dosages were worked out. Of the dusts tested against *A. argillacea*, Paris green at the rate of 1 kg. per hectare (about 0·9 lb. per acre) in an inert carrier and undiluted calcium arsenate at 5 kg. were both effective in 36 hours, but this period is too long under local conditions, since rains are frequent. It was reduced to 10 and 7 hours by increasing the amount of Paris green per hectare to 1·125 and 1·5 kg. respectively, and to 10 hours by applying a mixture of calcium arsenate and Paris green (9 : 1) at 4·5 kg. Lead arsenate was less economical. None of the dusts caused any injury to the plants. Arsenical sprays and dusts were effective but slow in action against the larvæ of the Noctuid, *Thyreion gelotopœon* Dyar, and the mixture of calcium arsenate and Paris green proved effective against the weevil, *Chalcodermus niger* Hust., when applied at the rate of 5 kg. per hectare. Good control of *Aphis gossypii* Glov. was given by a dust of nicotine sulphate containing 7½ per cent. nicotine and applied at the rate of 6·5 kg. per hectare, and it was cheaper than a spray of nicotine sulphate and soap. Sprays of nicotine sulphate and fish-oil soap were effective against the Tingid, *Gargaphia torresi* Costa Lima, but too costly except on a small scale. Dust insecticides were, in general, preferable to sprays for the control of sucking insects. Finely powdered slaked lime is an excellent carrier for arsenicals in dusts, which should be applied when the leaves are wet with dew.

421. Bengal: Annual Report of the Economic Botanist, 1939-40. (*Rpt. Dpt. Agr. Bengal*, 1939-40, Pt. II. Alipore, 1941. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 104.) Cotton was attacked by *Sphenoptera gossypii* and *Sylepta derogata* during the season, and in one district ratoon cotton was severely infested by *Cerococcus hibisci* Green.

422. Nyasaland: Plan of Research on Insect Pest Control. By E. O. Pearson. (*Nyasaland Agr. Qrtrly. Jour.*, January, 1942, p. 27.) A clear and concise exposition of the lines on which the study of cotton pests is being carried out with a view to the speediest possible reduction of the damage due to such cotton pests and diseases in the Lower River areas.

423. United States: Report of the Chief of the Bureau of Entomology and Plant Quarantine. By L. A. Strong and A. S. Hoyt. (*U.S. Dpt. Agr., Bur. Ent. and Pl. Quar. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 87.) The work in connection with cotton insects included biology and control of the bollweevil, cotton flea hopper, leaf and root aphids, hempterous insects (*Lygus, Chlorochroa* and *Euschistus* spp., etc.), bollworm, pink bollworm, particle size of insecticides for cotton insects, and *Thurberia* weevil control.

424. Cotton Insects of the United States. By V. A. Little and D. F. Martin. (Burgess Pubg. Co., Minneapolis, Minn. Price: $2.25; post free for payment in advance. From *Rev. App. Ent.*, Ser. A, **30**, 7, 1942, p. 363.) The authors have summarized the results of the large amount of work done by entomologists on the insects that attack cotton in the United States. The subjects dealt with are

mainly their bionomics and control, but information is included on distribution, alternate food-plants and the morphology of the various stages. The first section deals with insects that feed on the squares, flowers and bolls, and the second with those that attack the leaves, stems and roots. About half of the first section is devoted to *Platyedra gossypiella* Saund., *Heliothis armigera* Hb., and *Anthonomus grandis* Boh.

425. California: Cotton Insects. By G. L. Smith. (*California Sta. Bull.* 660, 1942. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 91.) Contains biological and control information on 28 insects deemed important in California, 6 of little or no importance, and 6 beneficial insects commonly found on cotton in the San Joaquin Valley.

426. Georgia: Cotton Insect Investigations. (*Ga. Coastal Pl. Sta. Bull.* 31, 1940. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 216.) A progress report mentioning studies on bollweevil, bollworms and aphids and their control on Upland and Sea Island cotton.

427. Studies of Western Aphids. By G. F. Knowlton. (*Utah Acad. Sci. Art and Letters, Proc.*, 18, 1940-41. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 809.) An annotated list of aphidæ of western United States, which includes host plant range and distribution.

428. Food-Plant Catalogue of the Aphids of the World, Including the Phylloxeridæ. By E. M. Patch. (*Bull.* 393 of the Maine Agr. Exp. Sta., Orono, Maine, U.S.A., 1938.) This catalogue is a compilation from aphid literature up to and including 1935. The contents of the volume are as follows: Prefatory Note, Acknowledgments, Food-plant Catalogue, Aphids for which Food Plants are not recorded in the Catalogue, Bibliography, Index to Plant Families, Index to Aphids.

429. Cotton Aphid Multiplication following Treatment with Calcium Arsenate. By E. W. Dunnam and J. C. Clark. (*J. Econ. Ent.*, **34**, 4, 1941, p. 587. From *Rev. App. Ent.*, xxx., Ser. A, 5, 1942, p. 264.) The results of preliminary studies on the factors that cause the increase of *Aphis gossypii* Glov. on cotton after dusting with calcium arsenate, carried out in Mississippi in 1938, when the numbers of parasites and predators present were insignificant, indicated that some of the insecticide was taken up by the leaves and some by the root system. The *p*H of the soil, and probably also that of the leaf cell sap, was increased in the plots of cotton dusted with calcium arsenate, and earlier maturity of the plants and shedding of leaves were associated with the increase. It was considered that the arsenic stimulated aphid reproduction and caused the shorter pre-reproductive period, the greater number of young born daily and the larger total number of young per aphid observed on the dusted plants. Further work showed that the *p*H of the cell sap in the leaves was consistently higher in plants dusted with calcium arsenate than in the control plants; that aphids multiplied more rapidly when caged on cotton leaves dusted with calcium arsenate containing 0·7 per cent. water-soluble arsenic pentoxide, as determined by the New York method, than when caged on untreated leaves, and even more rapidly on leaves dusted with calcium arsenate containing 13·9 per cent. water-soluble arsenic pentoxide. On cotton dusted with hydrated lime, aphids reproduced slightly faster than on the control plants, indicating that, though the amount of water-soluble arsenic was the most important factor, the hydrated lime in the calcium arsenate also contributed to the increase in aphids. In 1939, cotton plants were sprayed and dusted with a number of substances with different *p*H values (from 2·16 to 11·8) in an effort to find a material that could be used with commercial calcium arsenate to act as a buffer for the water-soluble arsenic pentoxide, reduce the alkalinity and permit the cotton plant to overcome any

possible injury caused by the remaining water-soluble arsenic pentoxide. The aphid population was relatively low in all plots, but plants dusted with zinc arsenate, with a *p*H of 6·4, had fewer aphids, appeared in better condition at the end of the summer, and produced higher yields than those treated with the other materials. It is considered, therefore, that zinc salts would probably be the most suitable materials for use with calcium arsenate for the control of cotton pests.

430. Control of the Cotton Aphid and Boll Weevil in 1940. By R. L. McGarr. (*J. Econ. Ent.*, **34**, 4, 1941, p. 580. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 68.) Calcium arsenate and mixtures of calcium arsenate and sulphur for boll-weevil control caused significant increase in cotton aphid populations in 1940. The addition of derris to these materials effectively controlled the aphids and held the populations at nearly the same level as the checks. Calcium arsenate and calcium arsenate-sulphur mixtures with derris gave good control of boll weevil.

431. Combinations of Insecticides for Control of Boll Weevil and Cotton Leaf Aphid. By C. F. Rainwater and F. F. Bondy. (*J. Econ. Ent.*, **34**, 1941, 2, p. 297. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 504.) In comparative tests conducted near Florence, South Carolina, in 1939, in which several insecticides and combinations of insecticides were employed in the control of the cotton boll weevil and cotton leaf aphid "calcium arsenate, mixtures of equal parts of calcium arsenate and two fixed-nicotine dusts, and barium fluosilicate plus derris (to give a rotenone content of 0·5 per cent.) were significantly better than two of the three cryolites tested with or without the addition of derris for boll-weevil control, when based on average seasonal infestation. Yield records and boll counts did not show significant differences between treatments. The cryolites and barium fluosilicate with derris were inferior to calcium arsenate in dusting qualities but were followed by aphid populations of only 12 to 24 per cent. of those with calcium arsenate. Equal parts of calcium arsenate and fixed-nicotine dusts held the aphid population to approximately 50 per cent. of that in the undiluted calcium arsenate treatments. Equal parts of calcium arsenate and sulphur, or of calcium arsenate and diatomaceous earth, with the addition of derris gave satisfactory boll-weevil control and kept the aphid population equal to or below that of the checks."

432. Topping Cotton in Early Fall as a Possible Means of Reducing the Spring Boll Weevil Population in the North-Western Part of the Florida Sea Island Cotton Belt. By P. W. Calhoun. (*Florida Ent.*, **24**, 2, 1941, p. 35. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 288.) The investigations described were carried out in view of the exceptionally large numbers of boll weevils (*Anthonomus grandis* Boh.) that develop in autumn in cotton bolls in the upper parts of the plants in the north-western part of the Florida Sea Island cotton belt. These populations commonly exceed 10,000 weevils per acre, and control is so difficult that the growing of Sea Island cotton on a large scale generally has to be abandoned. An experiment was made in the autumn of 1940 over some 200 acres of heavily infested cotton; most of the fields had produced less than half their crop. Almost all the bolls on the upper half of the plants contained 2-5 larvæ or pupæ, while the tops were producing an abundance of squares. The plants were topped on September 10, about 10 days before the final picking; the upper parts (about one-third of each plant) that contained bolls severely infested with advanced-stage larvæ or pupæ were cut off, in order to destroy as much of the squaring portion as possible without discarding any sound bolls. As soon as the discarded tops died, the adult weevils feeding on them moved back to the plants, and fed on the few remaining squares and on bolls that were not ready to open. As the population had already been high

for several weeks, nearly all the sound bolls were tough, fibrous and almost ready to open. About two weeks after topping, the adult weevils began to decrease in numbers until only a few remained. Whether most of them died or migrated is not known. The immature stages died in great numbers in the young bolls on the removed tops, and the percentage emergence was much lower than it would have been had the tops remained on the plants. The bolls on the living plants that had been attacked, but not completely ruined, by the weevils apparently opened more quickly and fully as a result of topping, which seemed to result in less waste cotton being left in the field at the final picking. It is thought that the cost of the operation was more than covered by the increase in the amount of the cotton harvested. Data are reviewed from the literature indicating that an abundance of squares and blossoms in autumn increases the weevils' chance of surviving the winter, and original observations are recorded which showed that newly emerged weevils fed on young cotton leaves, mature green leaves, or squares all gained equally in weight, but that those fed on squares did so more rapidly; it was considered that the weevils that fed on leaves could not have oviposited normally. When adults taken in the field were given moisture but not food, very few survived for more than a few days after losing 20 per cent. of their weight; the loss of weight was generally slow and regular until two or three days before death, when it became irregular and rapid. If an abundance of squares in autumn helps the weevil to survive the winter, the scarcity of squares in the fields that have been topped will decrease the percentage survival of the relatively few weevils that remain, and so increase the effect of the reduction in the population caused by the topping. If practised co-operatively on a sufficiently extensive scale, topping should thus prevent the occurrence of the heavy spring populations that are common in the north-western part of the Florida Sea Island cotton belt. It is not recommended for the central and southern parts of this belt, however, as the same result can be better obtained there by early picking followed by prompt destruction of the stalks.

433. Texas: Insect Damage, 1942. (*Cotton*, M/c, 18/7/42, p. 6.) Reports from Texas Agricultural Experiment Station indicate that boll weevils are injuring about a third of the older squares, with greater damage occurring in parts of south and central Texas. During the week ended June 27 no flea hopper damage was reported outside of river bottom fields, and in general it appears that this year flea hoppers will be of minor importance only. Thrips have delayed the development of early planted cotton in North Texas.

434. The Alternate Host Plants and Associated Parasites of *Pempheres affinis* Faust in South India. By P. N. Krishna Ayyar. (*Ind. J. Ent.*, **2**, 2, 1940, p. 213. From *Rev. App. Ent.*, xxx., Ser. A, 10, 1941, p. 521.) An account of investigations begun in 1937 on the alternative food-plants of the cotton stem weevil, *Pempherulus* (*Pempheres*) *affinis* Faust, in Madras and the parasites of it that are associated with them. The weevil was observed breeding on 17 species of wild and cultivated plants, in addition to cotton, mainly belonging to the Malvaceæ and Tiliaceæ.

435. The Biology and Distribution of the Parasites of the Cotton Stem Weevil, *Pempheres affinis* Fst., in South India. By P. N. Krishna Ayyar. (*Proc. Ind. Acad. Sci.*, **14**, 5, 1941, p. 437. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 301.) A list is given of 15 Hymenoptera that parasitize the larvæ of *Pempherulus* (*Pempheres*) *affinis* Faust on cotton and other plants in South India, together with descriptions of all stages and information on the life-history, frequency, distribution, alternate hosts and natural enemies of most of them. It is concluded that the percentage of natural parasitism in cotton fields is too

low to afford adequate control, but that it might be improved by artificial multiplication and liberation of at least *Spathius critolaus* Nixon.

436. Biological Control of the Cotton Stem Weevil, *Pempherulus affinis* Fst., in South India. By P. N. Krishna Ayyar. (*Ind. J. Agr. Sci.*, xii., 1, 1942, p. 58.) The subject is dealt with under three main heads: I. *Studies on the weevil:* Distribution, seasonal history. II. *Studies on the parasites:* Parasites in association with cotton; Parasites in association with alternate host plants; Mass breeding, experimental releases, and recoveries. III. *Present position of the problem, and conclusions.* Much of the information contained in the paper has already been abstracted from other sources.

[*Cf.* Abstrs. **167, 168, 420,** Vol. XVIII., and **167, 434, 435,** Vol. XIX. of this Review.]

437. Effect of Temperature and Humidity on the Development of the Eggs and Larvæ of the Boll Worm. By I. A. Rubtzov. (*Bull. Pl. Prot.*, 1, p. 9, Leningrad, 1941. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, 8, 1942, p. 374.) The following is based on the author's summary of laboratory investigations in 1937 on the effect of temperature and humidity on *Heliothis armigera* Hb. They were made in Leningrad on the offspring of moths from pupæ collected in cotton fields in Azerbaijan. The lowest and highest temperatures at which development occurred were found to be about 14° C. (57·2° F.) and 37-38° C. (98·6-100·4° F.) for the eggs, 14-16° C. (57·2-60·8° F.) and 35-36° C. (95-96·8° F.) for the larvæ, and 11-14° C. (51·8-57·2° F.) and 34° C. (93·2° F.) for the pupæ. The duration of development depended largely on temperature and the type of food offered. Thus, larvæ that fed on tomatoes and maize developed more slowly than those given leaves of *Chenopodium album* and *Senecio vulgaris*. The eggs were resistant to a wide range of temperature and humidity, and the larvæ fairly so, the optimum for the latter being 27-28° C. (80·6-82·4° F.) and 100 per cent. relative humidity for the early instars and 25-26° C. (77-78·8 F.) and 80-90 per cent. for the later ones. The pupæ were sensitive to variations in humidity and were not very resistant to cold. The chief cause of larval mortality at various combinations of temperature and humidity was found to be sameness of food; for satisfactory development, a change of food is essential, especially for the older instars, which need seeds. If the threshold of development is assumed to be 10° C. (50° F.) the sum of effective temperatures necessary for the development of a generation is about 700 day-degrees C. (1,260 F.), so that in the areas in which the moth is a pest of cotton four to six generations could be produced during a season. In the part of Russia adjoining the Baltic, however, the moth is rare, although the temperature in certain districts would in theory permit the development of two complete generations a year.

438. The Relation of Moisture Content of the Cotton Plant to Oviposition by *Heliothis armigera* Hbn. and to Survival of Young Larvæ. By R. K. Fletcher. (*J. Econ. Ent.*, **34**, 6, 1941, p. 856. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) An examination of the data obtained during the years 1935-39 showed that the correlation between the average percentage of moisture in the entire cotton plant and number of eggs per 100 plants was not significant. The correlation between oviposition and the percentage of water occurring in the growing tips only was found to be not significant in 1938 but was significant in 1939. In 1939 a highly significant correlation was found between the number of larvæ at each point and the percentage of moisture in the growing tips based on the weight of water in the entire plant. This highly significant correlation occurs even though it has often been found that a high percentage of the first-instar larvæ is destroyed by predators.

439. Numbers of *Heliothis armigera* Hbn. and Two other Moths captured at Light Traps. By C. H. Martin and J. S. Houser. (*J. Econ. Ent.*, **34**, 4, 1941, p. 555. From *Rev. App. Ent.*, xxx., Ser. A, 5, 1942, p. 260.) The results are given of experiments carried out in 1938 and 1939 in Ohio to compare the attractiveness to adults of *Heliothis armigera* Hb. of electric lights including incandescent, mercury vapour and fluorescent lamps, that ranged over a wide scale of brilliance and differed in spectral distribution; records for *Cirphis unipuncta* Haw. and *Protoparce sexta* Joh., obtained in 1939, are included. There were many nights on which *H. armigera* did not come to the light traps, even when it was present in the field, and there was no sharp difference in response to the various lights; many individuals flew straight into the lights, but others rested on neighbouring plants and sometimes oviposited before completing their flight. In 1938, when traps containing five different lamps were operated in tomato fields, 100-watt mercury vapour lamps, with a brightness of 3,400 lumens, attracted three or four times as many moths as a 15-watt fluorescent lamp or a 150-watt incandescent lamp (270 and 2,610 lumens, respectively), though daily records showed that on several nights the number of moths caught at the fluorescent light equalled or exceeded the number caught at the mercury vapour light. In 1939, when 10 lamps were compared in traps in fields of tomato and sweet maize, a 1,000-watt mercury vapour lamp with an intensity of 65,000 lumens did not appear to be any more attractive than a blue fluorescent lamp giving 2,300 lumens or a 100-watt mercury vapour lamp giving 3,400 lumens, but it was the most attractive to *P. sexta*. The 1,000-watt mercury vapour light attracted more insects in general than the 100-watt mercury vapour light or a cluster of five 20-watt blue fluorescent lamps.

440. Hibernation of the Corn Earworm (*Heliothis armigera*) in South-eastern Georgia. By G. W. Barber. (*U.S. Dpt. Agr., Tech. Bull.* 791, 1941. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 359.) Corn earworm hibernation was studied during the years 1930-33 in Chatham County. An average of 51 per cent. (range 30-80 per cent.) of the individuals that entered soil in cages to pupate during the fall survived the following spring. Larvæ dug pupal burrows from less than 1 in. to more than 10 in. deep. Three types of emergence were noted—immediate, delayed within the current year, and delayed until the following year. Moths emerged from May 1 to July 23 in 1931, from April 2 to June 27 in 1932, and from April 18 to July 27 in 1933. The variation in depth to which larvæ burrow apparently enables the earworm to survive disasters that might befall the active stages above ground, since resting pupæ were continuously present in the soil and moths emerged throughout the growing season. As few of the larvæ that mature in early corn hibernate, it is concluded that if all field corn of an area could be planted early and be followed by crops that are not attractive as food plants for earworms, overwintering populations would be reduced, and a lowering of the level of population of the insect might result.

441. The Results of the Use of the *Trichogramma* of the Azerbaijan Race as a Control Measure against the American Cotton Bollworm on Cotton Plants in the Azerbaijan, U.S.S.R. By I. N. Goretzkaya. (In Russian.) (*Bull. Pl. Prot.*, 1-2, 1940, p. 166. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 146.) The Azerbaijan race of *Trichogramma evanescens* Westw. was first reared in 1936 from eggs of the Noctuid, *Apopestes spectrum* Esp., collected near Kirovabad, and in field experiments carried out there in 1936-38, in which large numbers of parasites were liberated against eggs of *Heliothis armigera* Hb. (*Chloridea obsoleta* F.) on cotton, it proved more effective than the Azov-Black Sea race and the Central Asiatic form (subsequently described as *T. turkestanica* Meier). It was found that in the climate of Kirovabad, which is intermediate

between the dry subtropical and temperate climate, development of the Azerbaijan race continued throughout the summer, provided that eggs of *H. armigera* were sufficiently numerous. None of the three forms, however, survived even for a season in the Mugan steppe, where the climate is of the dry subtropical type with sharp fluctuations in temperature and humidity. The natural increase of the Azerbaijan race near Kirovabad is restricted by unfavourable weather in autumn and winter, and the lack of sufficient numbers of winter hosts. Observations in 1937-38 showed that the percentage parasitism of eggs of *A. spectrum* in May did not exceed 5, while that of eggs of *Pieris rapæ* L., *H.* (*C.*) *dipsacea* L., and *Plusia* (*Phytometra*) *gamma* L., in April was less than 1; no parasitism was found in eggs of *Pieris brassicæ* or *Tortrix* (*Cacœcia*) *strigana* Hb. The eggs of *H. armigera* on various crops were parasitized from mid-July to the end of August. It has been shown that the optimum temperature for these three forms is 25-27° C. (77-80·6° F.) and the optimum percentage relative humidity 64-66 for the Azerbaijan race, 70-75 for the Azov-Black Sea race, and 73-75 for *T. turkestanica*. Observations carried out in June-September, 1938, on the development of the three forms in the field after the release of adults on sample plants artificially infested with eggs of *H. armigera* or *Sitotroga cerealella* Ol. showed that the percentage of females in the following generation was considerably reduced when climatic conditions differed from the optimum. The percentage parasitism by the Azerbaijan race ranged from 16 to 62 and was also reduced when either temperature or humidity deviated from the optimum. The adult parasites did not spread by unaided flight for more than about 30 ft. from the point of release, but covered a distance of 100 ft. in the direction of a wind with a velocity of not more than 6·7 miles per hour. When the Azerbaijan race was released in cotton fields at the rate of a total of 200,000 per acre, the most satisfactory method was to liberate 5 batches of about 40,000 each at intervals of 3 days. Under these conditions, the percentage parasitism of *H. armigera* was maintained at an approximately even level of 40-48 throughout the period of application. When 3 batches of about 166,000 were released at intervals of 5 days, parasitism was high during the first 3 days after each release, but then decreased sharply. If applied against each generation of the moth and begun as soon as the first eggs appear, the 3-day system of release should reduce the numbers of larvæ of *H. armigera* by 45 per cent. or more. The parasites should be liberated in the evening at 40 separate points per acre, to secure an even distribution. Releasing them against *H. armigera* on *Hibiscus esculentus*, which is frequently grown as a trap crop for the moth in Azerbaijan, was ineffective, since the spines and sticky exudation on the capsules killed the adult parasites before they could reach the eggs of the moth. The percentage parasitism did not exceed 18·2.

442. Some Observations on Jassid at the Kenya Coast. By E. W. Gaddum. (*Emp. J. Exp. Agr.*, July, 1942, p. 133.) The technique employed for jassid counts is explained. Some records of jassid populations in 1938-40 are given; the figures show the comparative severity and duration of the infestation for each of the seasons under review. Significant differences between cotton varieties in their attractiveness to jassid were found in each season. A graph showing the difference in jassid population between the most attractive and the least attractive variety in the 1940 counts illustrates the range of variation between varieties, and shows that the differences are well marked throughout the period of infestation. Cotton interplanted with maize supported fewer jassid than cotton planted in a pure stand. By comparing jassid populations on the windward sides of double rows of cotton with the populations on the leeward sides, it was found that jassid was more numerous on the exposed sides. Planting of strips of maize as a windbreak reduced the jassid population of the protected cotton to less

than half that of the control. A field count designed to show the manner in which jassid causes losses in yield indicated that jassid has apparently no effect on flower-production or boll-shedding. It did appear to be associated with an increase in the number of shrivelled bolls on the plant and a corresponding decrease in healthy buds, flowers, and bolls. The drum experiment in 1939 (in which cotton was planted in oil drums, thirty plants to each drum) confirmed the 1938 observations that jassid had no effect on flower-production and boll-shedding. In this experiment, however, jassid also had no effect on the number of shrivelled bolls on the plant or on the yield. In the 1939 drum experiment jassid was associated with a large amount of staining and the appearance of *Diplodia gossypina* in the crop. A cage experiment in 1940 did not support the view that this association was any more than a chance one. During the period 1938-40 no association could be found between varietal attractiveness to jassid and yield. Similarly, reduction of jassid population by wind protection has not so far produced any evidence of increased yield. Field observations over a number of years confirm the view that severe jassid attack is not always associated with low yields. It is concluded that the main cause of the heavy crop losses in 1938 and 1939 was due to some cause other than jassid.

443. Guerra al Gusano Rosado de Algodon. By G. N. Wolcott. (*Agr. Exp.* [*Puerto Rico Univ. Sta.*], **1**, 5, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) A practical account of the fight against the pink bollworm.

444. Proyecto de Instalacion de un Insectario y sus Funciones. By R. G. Mallo. (*Bol. Mens. Junta Nac. del Algodon*, No. 76. Buenos Aires, 1941, p. 660.) Pink bollworm is a major pest of cotton in the Argentine Republic, and the factors contributing to its spread are briefly discussed. It is proposed to establish an insectarium near the Cotton Experiment Station in the Roque Saenz Pena Presidency for the study of pink bollworm and the breeding of parasites for its control. The most effective parasites appear to be *Chelonus blackburni* and *Microbracon mellitor*.

445. Secondary Hosts of the Pink Bollworm in the Lower Rio Grande Valley of Texas and Mexico. By F. F. Bibby and J. Moreno. (*J. Econ. Ent.*, **34**, 6, 1941, p. 736. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) The secondary hosts of the pink bollworm in this area are: okra, which ranks second to cotton in importance; *Malvaviscus drummondii*, found in the Lower Rio Grande Valley, part of Florida, Gulf Coast between Florida and Texas, and the Atlantic Coast between Florida and Pamlico Sound, N.C., which is occasionally infested; *Pseudobutilon lozani*, a mallow found in nine counties of Texas and in Mexico, from which two pink bollworm moths emerged.

446. Fatal Temperatures for the Pink Bollworm (*Platyedra gossypiella* Saund.) of Cotton. By H. S. Pruthi and T. Ahmad. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 906.) An account of investigations carried out in 1940 at the Imperial Agricultural Research Institute, New Delhi. The results have shown that complete mortality is effected when naked larvæ are exposed for 24 hours to 45° C., 1-2½ hours to 50° C., 7-10 minutes to 55° C., 5 minutes to 65° C., or 1 minute to 70° C. If instead of naked larvæ the cotton seeds containing larvæ are treated, and are brought from and taken to a room temperature of 35-40° C. in a thin layer, an exposure of a little over 3 hours to 50° C., 40 minutes to 55° C., 15 minutes to 60° C., 7-10 minutes to 65° C., or 3-5 minutes to 70° C. is completely fatal to larvæ within the seeds. It may thus be concluded that from a practical point of view, where the time factor is of considerable importance in dealing with large quantities of material, the exposure of seeds to heat should be so regulated in reference to the initial and final seed temperature and the nature of the seed,

etc., that the larvæ inside the seeds are at a temperature of 65-70° C. for 1-2 minutes. Concerning the part played by atmospheric moisture in determining larval mortality at different high temperatures, it is shown that under relatively dry conditions the larvæ resist high temperatures better, and, therefore, longer exposures would be required to ensure complete mortality. For instance, while an exposure of seed for 24 hours to 45° C. is completely fatal to larvæ if the saturation deficiency of air is 3-14 mm., it is not fatal if the saturation deficiency is 32 mm. Experiments on the protection afforded by the variety of cottonseed to the larvæ inside them, during heat treatments, were conducted only on two cottons—viz., a *desi* variety (Mollisoni) and an American variety (289F). The results showed a slightly higher mortality in the larvæ in the American seed. The viability of cottonseed is not affected materially up to an exposure of about 30 minutes to 65° C. or 20 minutes to 75° C. or 10 minutes to 80° C., and this shows that there is a fair margin of safety between heat exposures fatal to larvæ and those injurious to the viability of the seeds. It is pointed out that seeds after coming out of the hot machine retain heat for some time, particularly if they are put into sacks immediately after treatment, and this period must be kept in mind while prescribing temperature and exposure. Experiments have shown that heat takes a considerable time to penetrate through a layer of cottonseed. For instance, when seeds were transferred from a room temperature of about 36° C. to a chamber at 68° C., seeds less than half an inch below the surface took 7-8 minutes to reach within a degree of the chamber temperature. These experiments emphasized that during heat treatment seeds should be exposed in a very thin layer, they should be kept constantly stirred, and the chamber air above the seeds must also be kept in motion. Investigations on the effect of sun heat as a method of killing larvæ inside seeds indicated that an exposure of infested seed to sun for 9 hours during the hottest part of the year (May) may not be completely effective if the day, although otherwise clear, follows a shower of rain giving rise to cool breeze. On the other hand, under ideal conditions of heat transmission only half an hour's exposure of infested seed to the sun during a comparatively cool month of March may give cent. per cent. mortality of larvæ. It may be said, however, that the factors on which the success of sun heat as a control measure depends are so variable that every individual exposure must be followed by an actual test of mortality among larvæ inside the treated seed before the particular consignment can be said to have been effectively treated.

447. Preliminary Notes on the Parasites of the Spotted and the Pink Bollworms of Cotton in Coimbatore. By M. C. Cherian and M. S. Kylasam. (Coimbatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 174.) The spotted bollworms *Earias fabia* and *E. insulana* that infest the cotton buds and bolls are subject to field parasitization by five parasites—*i.e.*, *Microbracon lefroyi* D. and G., *Rhogas aligharensi* Quadri, *Bassus* n.sp., *Elasmus johnstoni* and *Actia hyalinata*. The caterpillars of *Platyedra gossypiella* infesting cotton buds and bolls are attacked in nature by the following parasites: *Goniozus* n.sp., *Apanteles pectinophoræ* and *Microbracon gelechidiphagus*. This bethylid is of the blossom-infesting type; hence a very high parasitization of the pink bollworms infesting flowers is recorded. As high as 49 per cent. of the worms were found attacked in July. It is known to parasitize other hosts like the caterpillars of *Antigastra* and *Adisura*.

448. Control of the Common Red Spider on Cotton. By D. Isely. (*J. Econ. Ent.*, **34**, 2, 1941, p. 323. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 133.) An account is given of field tests with sulphur alone or mixed with 5 per cent. of a commercial dust containing 1 per cent. dinitro-ortho-cyclohexylphenol in

walnut-shell flour against *Tetranychus telarius* L., on cotton, carried out during an extensive outbreak that occurred in north-eastern Arkansas in the summer of 1940. The dusts were applied between July 28 and August 7, when infestation was spreading. Since most infestations originated from woodland or banks adjacent to the cotton and a few from vegetation round stumps, the total area to be dusted was not great, and small dusters were used. Infestation was spread by cultivation and sometimes by the operation of dusting, and appeared to be more extensive where the plants were rank and had interlacing branches. The percentages of previously infested leaves on which active mites were present within a week after dusting were 26·67 following the mixture and 84·57 following sulphur; mites occurred on 98·83 per cent. of the injured leaves in the controls. There were very few mites per leaf in the first case and relatively few, compared with the control, in the second. Single applications of either dust checked the spread of the mite, though three were necessary to eradicate it in a few places; eradication followed more readily where the mixture was used. No plant injury was caused by the dinitro-o-cyclohexylphenol at the concentration tested (1·05 per cent.). On other plantations on which sulphur was applied, the results were variable and the degree of control appeared to be proportional to the thoroughness of the application. Dusting from above had little value, particularly on rank cotton; it was necessary that the infested foliage should be covered with the dust.

449. The Sand Wireworm. By J. N. Tenhet. (*U.S. Dpt. Leafl.* 212, 1941. From *Cott. Lit.*, April, 1942, p. 121.) The sand wireworm (*Horistonotus uhlerii* Horn) is a serious pest of cotton, corn, and other crops in certain areas of the coastal plain of South Carolina, and also, at times, in various other cotton states. Farm practices that will reduce losses from this pest are given.

450. Los "Manchadores" del Algodon en Venezuela. By G. Vivas-Berthier. (*Bol. Soc. Venezol. Cienc. nat.*, **7**, 48, 1941, p. 115. From *Rev. App Ent.*, xxx., Ser A, 6, 1942, p. 314.) In view of proposals to increase the cultivation of cotton in Venezuela, notes are given on the types of injury caused to it by *Dysdercus* and measures for the control of these bugs. The species of this genus that have been observed there are *Dysdercus ruficollis* L., *D. pallidus* Blöte, *D. chiriquinus* Dist., *D. fernaldi* Ballou, *D. peruvianus* Guer., *D. obliquus* H.-S., and *D. mimus* Say. The last four have been taken in cotton, and the last two have not previously been recorded from Venezuela.

451. Control of Thrips on Seedling Cotton. By J. R. Eyer and J. T. Medler. (*J. Econ. Ent.*, **34**, 5, 1941, p. 726. From *Rev. App. Ent.*, xxx., Ser. A, 7, 1942, p. 358.) As a result of severe damage to seedling cotton in New Mexico in the spring of 1941 by a thrips identified as *Frankliniella occidentalis* Perg. sprays consisting of either 2 lb. tartar emetic, with 1 U.S. pint Dowax as a spreader, or 2 lb. of a proprietary sodium antimony lactophenolate, each with 5 lb. brown sugar in 50 U.S. gals. water, were tested during the first week in June. Counts made 1, 2 and about 7 days after treatment showed significant reductions in the numbers of thrips on the plants in all cases except the first count after the use of the proprietary compound. Examination a week after spraying showed a rapid recovery of treated plants.

452. The Probability Law in Cotton Seedling Disease. By K. S. Chester. (*Phytopathology*, xxxi., 12, 1941, p. 1078. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 196.) At the Oklahoma Agricultural Experiment Station a mathematical analysis was made of the survival of cotton seedlings in the greenhouse and field under varying conditions of infection by *Glomerella gossypii*, *Fusarium moniliforme* (*Gibberella fujikuroi*), *Rhizoctonia* (*Corticium*) *solani*, and other seed-infesting fungi, with a view to determining the extent to which an infected plant is

hazardous to those in the immediate vicinity. Given freedom from severe infection by *C. solani*, the mortality of seedlings from diseased seed followed a random distribution, agreeing with the formula derived by expansion of the binominal equation. The absence of a skew distribution, with an excessive number of seedling failures in hills containing one or more infected seeds, is taken to indicate that, *C. solani* being excluded, diseased seedlings do not ordinarily constitute a threat to the health of adjoining sound ones. This hypothesis was confirmed by direct observation of the success of healthy seedlings in the presence of diseased ones in soil free from *C. solani*, as well as by the equal emergence rates of seedlings from mixtures of infected and sound seed whether planted under conditions of many or few potential contacts between diseased and healthy seedlings. On the other hand, where *C. solani* was a factor, an unduly high proportion of seedling failures, attributable exclusively to this cause, was registered in hills originally containing one or more diseased seedlings. These data explain the greater utility of ceresan seed treatment in the south-eastern States, where *G. fujikuroi* and *Glomerella gossypii* are the principal agents of seedling disease, as compared with those of the south-west (Texas and Oklahoma), in which acid delinting is more successful against the predominant pathogen *C. solani*, by curtailing the period of susceptibility of the host. In this connexion the writer emphasizes the urgent need for further development of chemical protection of cotton and legume seed against *C. solani* in the south-west, volatilization over a relatively long period being the foremost requirement in a fungicide intended for such a purpose. The observation that the infection of a given seedling does not endanger the health of those surrounding it has a bearing on the planting value of partially infested seed, which may be regarded, other factors being equal, as proportional to the results of laboratory germination tests.

453. Isolation and Infection Tests with Seed- and Soil-Borne Cotton Pathogens. By W. W. Ray and J. H. McLaughlin. (*Phytopathology*, xxxii., 3, 1942, p. 233. From *Rev. Appl. Mycol.*, xxi., 7, 1942, p. 331.) Particulars are given of a series of greenhouse tests conducted at the Oklahoma Agricultural Experiment Station to determine the relative pathogenicity of a number of seed- and soil-borne fungi to three cotton varieties—*viz.*, Acala (1938 Oklahoma crop), Paymaster (1939 Texas), and D. and P. L. 11A (1938 Mississippi), the organisms being inoculated into (*a*) sterile soil (2 parts loam and 1 each of sand and sewer sludge) in which sterile seed was subsequently planted, and (*b*) cotton seedlings grown under sterile conditions in test tubes on water agar. The data were collected at the end of 28 days in most of the trials. At an average temperature of 80° F. and with an ample water supply for the plants, the four most virulent pathogens were *Glomerella gossypii*, *Rhizoctonia* (*Corticium*) *solani*, *Fusarium scirpi*, and *F. moniliforme* (*Gibberella fujikuroi*) in the order named. In the excessively humid atmosphere induced by heavy and repeated watering (several times daily) at a temperature of 80°, all the organisms tested, especially *G. fujikuroi*, acquired an access of virulence, with the exception of *F. vasinfectum*. Conversely, a decline in pathogenicity was manifested by most of the fungi, excepting *Glomerella gossypii*, *C. solani* and *F. scirpi*, in soils kept only just moist enough to maintain the growth of the seedlings. Plants transferred to the open (65°) after several days at 80° were severely attacked by *C. solani* and *F. scirpi*, the other fungi causing no serious injury under these conditions. *G. gossypii* and *C. solani* were responsible for considerable damping-off in soils rendered alkaline (*p*H 8·3) by the addition of lime, and were also injurious in those with an acid reaction (6·3) due to the incorporation of sulphur. Since *G. gossypii* was shown to have the heaviest infection index (obtained by multiplying the percentage of severely diseased plants in each by three, moderately infected by two, and

slightly attacked by one, totalling, and averaging), it was given an arbitrary weighted index of 100, the proportions to which of the other fungi concerned were as follows: *C. solani* 86, *F. scirpi* (isolate D) and its var. *acuminatum* 58 and 56 respectively, *F. chlamydosporum* 53, *G. fujikuroi* (isolate 110) 52, *F. vasinfectum* (27) 48, *F. scirpi* (44A) 47, *F. solani* 46, *F. equiseti* var. *bullatum* 46, *Sclerotium bataticola* (41), [*Macrophomina phaseoli*] 45, *F. semitectum* 42, *G. fujikuroi* (115) 40, *F. vasinfectum* (24), 37, *G. fujikuroi* (18) 35, *F. vasinfectum* (27) 34, and *M. phaseoli* (R 37) 30. Of all these fungi *C. solani* is regarded as the most injurious to cotton seedlings in Oklahoma, where it is widely distributed in the soil and very difficult to control.

454. PLANT DISEASES IN TEXAS AND THEIR CONTROL. By A. A. Dunlap. (*Circ.* 91, *Texas Agr. Exp. Sta.*, 1941.) This 70-page circular gives brief descriptions and control measures for most of the common plant diseases affecting economic plants in Texas. The first part lists the various crops in alphabetical order and treats of the diseases most frequently found affecting these plants. The second part gives general information about certain diseases, such as cotton root rot, nematode root knot, crown gall, damping-off, chlorosis, etc., and the most recent measures of control. The third part of the circular deals with the methods and materials used in controlling plant diseases, and such topics as soil sterilization, seed treatment, fungicides, spreaders, and spraying and dusting equipment are discussed. Thirty photographs are included illustrating symptoms of certain diseases or results of some disease-control measures.

455. *Æcidium Gossypii*, THE ÆCIAL STAGE OF *Puccinia Bouteloucæ*. By J. T. Presley. (*Phytopathology*, xxxii., 1, 1942, p. 97. From *Rev. App. Mycol.*, xxi., 5, 1942, p. 253.) Field observations in the late summer and autumn of 1940 in Arizona having indicated the possibility of a connexion between the uredo- and teleuto-spores of a rust tentatively determined as *Puccinia Bouteloucæ* on the grasses *Bouteloua aristidoides* and *B. barbata* and the æcidia of *Æcidium Gossypii* on cotton, cross-inoculation experiments were carried out in the laboratory at the University of Minnesota in the following spring with positive results on Acala cotton, on the one hand, and four species of *Bouteloua* (the two above-mentioned, *B. curtipendula* and *B. gracilis*) on the other. A genetic connexion between the two stages may therefore be regarded as established. The question arises, however, whether *P. Bouteloucæ* is identical with the morphologically very similar *P. vexans*, which are separated by Arthur on the basis of teleutospore pedicel length. The writer could find no justification for this distinction, and should further examination reveal the existence of only one species the name *P. vexans* would take priority over *P. Bouteloucæ*.

456. WIND DISSEMINATION OF ANGULAR LEAFSPOT OF COTTON. By J. G. Brown. (*Phytopathology*, xxxii., 1, 1942, p. 81. From *Rev. App. Mycol.*, xxi., 5, 1942, p. 252.) In September, 1940, in Southern Arizona, a 240-acre field of the S × P cotton variety, susceptible to blackarm (*Bacterium malvacearum*), raised from sulphuric acid-delinted and ceresan-dusted seed, contracted extensive and uniform infection by the blackarm phase of angular leafspot, adjacent fields being proportionately less severely attacked. The most intensively infected field lay directly west of a half-section of land planted with untreated or " fuzzy " seed, and adjoined on the west, without barrier, a similarly planted 80-acre field. A field of cotton raised from treated seed, lying north of the above-mentioned half-section, contained more diseased plants on the side contiguous to the latter, while in a ranch to the south the only infected plants were situated on the side adjoining the half-section. Evidence was available to the effect that the cultivated cotton

in the untreated fields constituted the sole source of inoculum, which was apparently conveyed to the treated cotton by a dust storm on August 20, following injury to the plants by hail a week earlier. The heaviest infection reached the field on the west of the half-section raised from untreated seed, but the inoculum-bearing dust also spread laterally westwards in a fan-shaped belt in such a way as to involve bordering fields on the north and south, while at the same time infective material from the 80-acre field planted with untreated seed was also borne westwards. Cotton fields serving as controls, situated at a distance of 12 miles from the infested areas and subjected to similar conditions, apart from the hail and dust storms, remained free from blackarm.

B. malvacearum was isolated exclusively from untreated seed. The writer's studies were facilitated by absence from the crop of all seed-borne diseases other than blackarm, and the virtual freedom of the fields from *Verticillium* (*albo-atrum*) and Texas root rot (*Phymatotrichum omnivorum*). Part of the damage attributed by farmers to blackarm, however, was really due to the air-borne *Alternaria* species.

457. A Survey of Cotton Boll Rot Diseases and Associated Micro-organisms in 1941. By P. R. Miller and R. Weindling. (*Pl. Dis. Rptr.*, xxv., 20, 1941, p. 518. Mimeographed. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 196.) As in the three preceding years of the cotton boll disease survey, *Glomerella gossypii* was again the predominant pathogen on material collected east of Texas and Oklahoma. On the other hand, the water-soaked spots commonly attributed to *Bacterium malvacearum* were less prevalent than heretofore, and the percentage of such lesions yielding the causal organism was much lower than in 1940—namely, 13 as compared with 41 per cent. Tables are given showing the frequency of occurrence of micro-organisms in sample lots of bolls and in cultures from individual bolls, expressed in terms of percentage in both cases.

[*Cf.* Abstrs. **306**, **752**, Vol. XVI., **175**, **433**, Vol. XVIII., and **177**, Vol. XIX. of this Review.]

458. Control of the Root-Knot Nematode by Cultural Practices. By J. C. LeRoux and F. J. Stofberg. (*Un. S. Afr. Dpt. Agr. and For., Sci. Bull.* 188, 1939. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 351.) The life-history and symptoms induced by *Heterodera marioni* are described. In this work infestations were effectively checked by starvation, eliminating all susceptible host plants. Clean cultivation for periods of 9 and 12 months gave better control than the 6-mo. summer or the 6-mo. winter treatment.

459. Cotton Root Rot Studies. By C. H. Rogers. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 168.) The results of the following studies are briefly discussed: The effect of rate of planting cottonseed on cotton root rot; the residual effect of different soil treatments on root rot in cotton; soil treatments for cotton root rot; relative humidity as affecting death rate of cotton plants with root rot; residual effect of crude oil, crank case drainings, and cotton bur ashes on germination of cottonseed, root rot, and yield of cotton; residual effect of applications of crude oil at different depths on germination of cottonseed, root rot, and yield of cotton; application of copper sulphate and crude oil in combination with deep tillage as affecting root rot in cotton; germination of seed and yield of cotton from seed from plants killed by root rot at different dates in 1939; analysis of cottonseed from cotton varieties grown in 1939 having different dates of maturity and different boll and lint characteristics.

460. Root Rot and its Control. By R. F. Crawford. (*New Mexico Sta. Bull.* 283, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 203.) *Phymatotrichum*

omnivorum root rot is an important plant disease in New Mexico and other parts of the South-west. It is native to the South-west, where the soils are alkaline, and has not been reported from areas where the soil is acid. This bulletin summarizes present knowledge concerning root rot, including the results of studies by the Station since 1921 relative to its distribution, economic importance, hosts, symptoms, etiology, life-history of the causal fungus, and control. Rotation with non-susceptible crops has long been recommended, but less than a 3-year rotation has proved of little value in the Mesilla and Pecos Valleys.

461. STUDIES ON THE ROOT-ROT DISEASE OF COTTON IN THE PUNJAB. XI. EFFECT OF MIXED CROPPING ON THE INCIDENCE OF THE DISEASE. By R. S. Vasudeva. (*Ind. J. Agr. Sci.*, xi.; 6, 1941, p. 879.) Describes experiments carried out at Lyallpur, and some experiments conducted at Khanewal to confirm the results obtained at Lyallpur. These results indicated that when cotton is intercropped with sorghum or *moth* (*Phaseolus aconitifolius*) the incidence of the root-rot disease is significantly reduced. Soil and air temperatures are lower within the mixed crop but humidity is higher than in the pure cotton plots. Two varieties of American cotton (LSS and KT25) when sown in mixture with *moth* gave higher yields than the pure cotton. Incidence of the disease is also reduced when cotton is sown in mixture with certain other crops.

[*Cf.* Abstrs. **307**, Vol. XIII., **127**, **711**, Vol. XIV., **139**, Vol. XV., **509**, **709**, Vol. XVI., **235**, Vol. XVII., **178**, Vol. XVIII., **192**, Vol. XIX. of this Review.]

462. FACTORS INFLUENCING THE GROWTH OF *Phymatotrichum omnivorum* ON DIFFERENT SOURCES OF NITROGEN. By P. J. Talley and L. M. Blank. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 85.) Experiments have shown that the utilization of ammonium nitrogen results in a more acid reaction in the media which may become a controlling factor in the growth of *P. omnivorum*. The utilization of nitrate nitrogen by the organism results in a drift toward a more alkaline reaction and usually does not retard growth. Experiments using carbonates and organic buffers show that ammonium nitrogen and nitrate nitrogen are of equal value in the nutrition of the organism when a favourable *p*H is maintained. No direct toxicity of ammonium has been observed.

463. SOME FACTORS INFLUENCING THE UTILIZATION OF INORGANIC NITROGEN BY THE ROOT-ROT FUNGUS. By P. J. Talley and L. M. Blank. (*Pl. Physiol.*, xvii., 1, 1942, p. 52. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 287.) A detailed, tabulated account of the writers' laboratory studies at the Texas Agricultural Experiment Station on the factors affecting the utilization of inorganic nitrogen by *Phymatotrichum omnivorum* in synthetic nutrient solutions. The consumption of nitrate nitrogen is influenced by the balance between potassium and magnesium, both of which are tolerated over a wide range providing the ratio of one to the other is neither unduly high nor extremely low. To a limited extent calcium may be substituted for magnesium and sodium for potassium. Ammonium utilization is modified by the ionic balance in the solution, the uptake by the organism of this source of energy being promoted, for instance, by high magnesium and high phosphates and by high calcium or sodium and high sulphates or chlorine, whereas a combination of high magnesium and high sulphates or chlorine acted adversely on growth. *P. omnivorum* proved to be tolerant of nitrites and able to assimilate nitrite nitrogen.

464. ANTECEDENTES SOBRE LA "ROYA" DEL ALGODONERO EN LA REPUBLICA ARGENTINA. By M. A. DiFonzo. (*Bol. Mens.* No. 73, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 419.) Some aspects are considered of this generally little known rust (*Cerotelium desmium*) of cotton in Argentina. The history and

nomenclature of the fungus, and the symptoms, method of transmission, and importance of the disease are briefly discussed.

465. *Sclerotium rolfsii* ON COTTON IN ARIZONA. By M. Gottlieb and J. G. Brown. (*Phytopathology*, xxxi., 10, 1941, p. 944. From *Rev. App. Mycol.*, xxi., 3, 1942, p. 138.) In addition to the recognized symptoms, the Arizona strain of *Sclerotium rolfsii*, which has caused such heavy damage to the cotton crop in the Salt River Valley and elsewhere during the past few years, was found to be responsible for a swelling of the main stem near the soil-line, apparently a sequel to seedling infection. The fungus was most prevalent in nematode-infested soils, but was also present in fields free from the agent of root knot; it spread in a somewhat sporadic fashion following irrigations and summer rains throughout the growing season. About December 16, a month after a killing frost, *S. rolfsii* showed much activity in these infested fields. Of great significance in relation to the perpetuation of infection is the detection of an abundance of inoculum on the decaying, ploughed-under stalks of the preceding cotton crop in fields showing no dying plants. The pathogen was first observed in Arizona in 1936 on larkspurs (*Delphinium*) and subsequently appeared on sugar beets about 150 miles distant from the site of the first outbreak; it was next observed on the latter crop some fifteen miles east of the affected cotton fields, to which, however, the manner of transmission remains for the present obscure. Mature cotton plants sustained exceptionally heavy damage from southern sclerotial rot in the epidemics under investigation, whereas Ezekiel and Taubenhaus found only one dying from the effects of the disease, while their inoculation experiments of mature plants failed.

[*Cf.* Abstr. **600**, Vol. IX. of this Review.]

466. HOW *Tirak* AFFECTS PUNJAB-AMERICAN COTTONS. By R. H. Dastur. (*Ind. Frmg.*, April, 1942, p. 181.) The Punjab-American cottons in the Punjab suffer from a physiological disease popularly known as *tirak* or bad opening of the bolls. The cotton crop, which is generally sown in May, appears healthy and normal up to September, when the crop is in its flowering phase. The symptoms of the disease first appear in the leaves, which begin to turn pale green and yellow. This is followed by reddening and shedding of the leaves. The bolls remain small and crack prematurely. The seeds in such bolls are partially or fully immature and bear very trashy lint which does not fluff out of the bolls. Normally 400 to 500 bolls are required to yield one seer (2 lb.) of *kapas*, but from 600 to 2,000 bolls are required when *tirak* is prevalent. The disease occurred in intense form in 1921, 1926 and 1928 and enormous losses were caused. Two types of soil were found to be associated with *tirak*: (1) light sandy soils with nitrogen deficiency and (2) sandy loams with salinity in the subsoil. The effects of these two types of soil on the growth of the cotton plant, and the intensifying effects of unfavourable weather conditions, are discussed.

[*Cf.* Abstr. **309**, Vol. XIX. of this Review.]

467. *Trichogramma*. (ECOLOGY AND RESULTS OF UTILIZATION FOR THE CONTROL OF INJURIOUS INSECTS.) By N. F. Meier. (Moscow, Sel'khozgiz, 1941. Price 5 rub. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, 8, 1942, p. 373.) The author has summarized and brought together in this book data from the world literature on the bionomics and ecology of egg-parasites of the genus *Trichogramma*, with special reference to recent work carried out in the Russian Union on their value for pest control. The first chapter deals with the species of *Trichogramma* that have been observed in the Union, and following chapters with the effect of environmental and other factors on their development and fertility. *Sitotroga cerealella* Ol. has proved so far the only suitable host for breeding the parasites on a large scale in the laboratory, and since special precautions have to

be taken to prevent its spread to stored grain attempts are being made to produce a wingless strain. Further subjects dealt with are the means by which the parasite spreads in a locality, its distribution in the crown of the tree, the technique of liberation, and methods of estimating its effectiveness against pests of different crops. The final chapter comprises a detailed survey of the practical results obtained with the various forms of *Trichogramma* in the Russian Union. The cotton pests against which they have proved of value are *Loxostege sticticalis* L. and *Heliothis armigera* Hb.

468. Some Points still to be worked out in the Cotton Wilt Disease. By G. S. Kulkarni. (Gwalior.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 168.) The seed-borne nature of the disease is obvious. But the fungus has not been located in the seed. Whether it occurs in the seed coat or in the cotyledons is still to be known. That it is not carried on the surface of the seed nor in its upper epidermal layers is quite certain in view of the effects of sulphuric acid treatment. The disease is prevalent in the black cotton soils and generally absent from alluvial soils. But even in the latter there are a few places where wilt is rampant. The reasons for this distribution are quite obscure.

469. The Reaction of Cotton Varieties to Fusarium Wilt and Root-Knot Nematode. By A. L. Smith. (*Phytopathology*, xxxi., 12, 1941, p. 1099. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 197.) Observations in the Coastal Plain area of Georgia in 1940 indicated an association between resistance to the root-knot nematode (*Heterodera marioni*) infestation and freedom from wilt (*Fusarium vasinfectum*), but the relationship appears to be casual, since some wilt-resistant varieties—*e.g.*, Delfos 425, Dixie Triumph 06-366, and Sea Island Seabrook 31-12 B-2—show no more resistance to root knot than the wilt-susceptible and semi-resistant varieties. Resistance to *H. marioni* was confined to wilt-resistant varieties originating in the lighter types of local Coastal Plain soil in South Carolina, such as Early Wilt, Coker's 4 in 1 strain 4, and Wannamaker Cleveland, whereas the wilt-resistant types developed on the heavier soils of Mississippi and Louisiana, where root knot is a less acute problem, were all susceptible to the nematode. Plant breeders and pathologists would be well advised to devote some attention to the selection of strains combining resistance to the nematode and fungus. In this connexion the writer describes a system for the numerical evaluation of nematode infestation in cotton plants, whereby an increasing incidence of root knot can be represented by a rising scale of numbers from 0 to 4.

GENERAL BOTANY, BREEDING, ETC.

470. Cytology, Genetics and Evolution. By M. Demerec *et al.* (Philadelphia : Univ. Pa. Press, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 171.) Papers are presented on the fundamentals of cytology and their application to genetics and evolution.

471. The Physiology of the Gene. By S. Wright. (*Physiol. Rev.*, **21**, 3, 1941, p. 487. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 171.) A review and discussion of the relation of gene reactions and interactions in a wide variety of plants and animals including, especially, quantitative interpretations of multiple allelic series in guinea-pigs and their effectiveness in controlling melanin production. Gene control of extra-organic structures is considered especially complex. There are 274 references to the literature.

472. Selectivity of the Common Genes. By P. D. Gadkari. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 34.) In a field crop of *desi* cottons four types occur differing from one another in respect of simple Mendelian factors

for corolla colour and leaf shape. These types are found in varying proportions in different tracts of India. Competition experiments were undertaken to ascertain the presence of any selective advantage that could explain the local status of the four types. The results are held to prove the existence of such advantage, resulting in the occurrence in excess of the expected proportions of the types favoured by natural selection.

473. Eine Biophysikalische Analyse des Mutationsvorganges. By N. W. Timofeeff-Ressovsky. (*Nova Acta Leopoldina*, 9, N.F., 1940, p. 209. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 166.) The work offers a comprehensive description of our present knowledge on the process of mutation and on the nature of the gene itself, especially as reached by biophysical investigations. By the use of exact quantitative methods, one can obtain from the action of ionized rays on the mutation frequency of the gene (gene or point mutations) quite definite ideas on this process. These are summarized in the " Treffer " theory (Timofeeff, Zimmer and Delbruck). According to this, the primary event for the liberation of a gene mutation is a single ionization occurring in a definite space (Treffbereich). The mutation itself is a structural change of a single, well defined atomic combination (molecule, micelle or part of a micelle). From this assumption it follows also that the gene itself or its most important part must represent a physico-chemical unit. Here there is an interesting and surprising connection with virus research, the conception of the gene as a physico-chemical unit is strongly supported by the discovery that at least many virus species are chemically individual monomolecular structures supplied with the possibility of reproducing convariants of themselves and eliciting specific physiological actions, characteristic also of genes. This latter indicates that the investigation of the mutation process and the structure of the gene ranges to-day far beyond the bounds of true genetics and requires the coöperation of biophysics, biochemistry, virus and immunity research. The present results are drawn almost entirely from the zoological side (from Drosophila) and this work is built up almost entirely from zoological literature. However, in spite of this it is welcome from the botanical side as an outstanding review of this important field of research.

474. Genes and Chromosomes—Structure and Organization. Cold Spring Harbour Symposia on Quantitative Biology. (George Banta Pubg. Co., Menasha, Wisconsin, 1941. Price $4.10. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 180.) The 1941 annual symposium on quantitative biology at Cold Spring Harbour was devoted to genes and chromosomes. Contributions by distinguished workers were presented on genetical, cytological, physical and chemical aspects, and these, together with the discussions which followed them, are published in the volume. The following papers are of more direct interest to plant breeders: " Chromosome continuity and individuality " (H. E. Warmke); " Multiple chromosome complexes in animals and polysomaty in plants " (C. A. Berger); " Spontaneous alterations in chromosome size and form in *Zea mays* " (B. McClintock); " The genetic control of mutability in maize " (M. M. Rhoades); " The comparison of ultra-violet and X-ray effects on mutation " (L. J. Stadler); " Mutation in Drosophila, bacteria and viruses " (J. W. Gowen); " The chemical composition of strains of tobacco mosaic virus " (W. W. Stanley and C. A. Knight). This selection gives an adequate idea of the scope and importance of the book, which deserves careful study from all interested in the progress of genetics. The only conspicuous deficiency concerns Darlington's cytogenetical theories; in places these are almost studiously ignored, in places they are in part tacitly accepted, but nowhere are they adequately discussed. Under the title of " Résumé and perspectives of the symposium on genes and chromosomes " H. J. Muller gives a masterly survey of the material presented at the Conference, and

knits together the evidence derived from microscopic study of the chromosomes, from investigations of mutations (gene and chromosome) and from biochemical and physical studies. The result is a thorough and constructive account of the present position of our knowledge of genes and chromosomes. In conclusion he describes an hypothesis to account for the specific attraction which it has been inferred must bring like parts together both in gene synthesis and synapsis, an hypothesis of super-resonance in large protein molecules.

475. Genetics and the Russian Controversy. By K. Mather. (*Nature*, 149, 1942, p. 427. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 149.) The author agrees with Lysenko that genetics has not contributed very much to the improvement of crops and stock, and suggests that this is due to geneticists neglecting the study of polygenic characters. The neglect of polygenetics is attributed to the early controversy between the Mendelians and the biometricians, to technical difficulties in the analysis of polygenic segregation and to geneticists being interested in other subjects such as linkage (from 1910 onwards), X-ray mutations (from 1927 onwards), Darlington's recasting of cytology in an inductive-deductive form in the early 1930's, giant salivary gland chromosomes in Drosophila (significance of these being understood in 1934) and Beadle and Ephrussi's investigations on gene action in 1935. It is suggested that the rejection of the whole of genetical theory is useless, and that an extension of experimental research on polygenetic inheritance will enlarge genetical theory so that it will be of real value to breeders.

[*Cf.* Abstrs. **260**, Vol. XVII., and **462**, Vol. XVIII. of this Review.]

476. I. Genética e Selecção. II. A Genética Continua a ser Atacada. By A. de Souza da Camara. (*Rev. Agr. Lisboa*, 1939, **27**, p. 410. *Ibid.*, 1940, **28**, p. 330. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 114.) An outline is given of the genetics controversy in the Soviet Union. The author admits the desirability of conducting breeding operations in the best possible conditions of growth, and that an absolutely pure line is never attained in practice. Hence the possibility of effecting an improvement in an existing variety by selection or by intravarietal crossing is admitted on purely genetical grounds. Owing to the heterozygosity of most experimental material it is conceded that the nature of the environment may influence the results of selection, but the weight of experimental evidence against the direct inheritance of acquired characters is regarded as too great to be readily discounted. With regard to vernalization, it is pointed out that heat and cold treatment may well result in mutation, which may be the cause of some of the hereditary results described. It is further pointed out that deviations from simple Mendelian ratios are frequently found to have some clear genetical or cytological cause and do not in themselves refute the whole science of genetics.

477. Memoirs of the Cotton Research Station, Trinidad. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The eighteenth number of Series A, Genetics, has recently been published, and contains the following paper reprinted from the *Journal of Genetics*:

Anthocyanin Pattern in Asiatic Cottons. By R. A. Silow and C. P. Yu. Seven additional types of anthocyanin in cotton are described and shown to be controlled by members of an extensive allelomorph system of which fourteen members are now known in the cultivated diploid Asiatic species *Gossypium arboreum* and *G. herbaceum*. All seven of the new types were found in China—six in field material, and the seventh as an anomaly in experimental cultures. The information relating to the genetical behaviour of this and similar series, whose manifold expressions do not conform to a single simple seriation, is reviewed from the standpoint of deciding between the alternative interpretations of close linkage and multiple allelomorphism with pleiotropy. Although the cotton series, in

which a new "pattern" arrangement appeared under controlled conditions, might have been expected to be a particularly suitable subject for this purpose, it was not possible to reach a definite conclusion on the experimental evidence.

478. A New Gene affecting Anthocyanin Pigmentation in Asiatic Cottons. By K. Ramiah and B. Nath. (*Proc. 28th Ind. Sci. Congr., Benares*, 1941, Pt. III., Sect. Agr., p. 258. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) A new member of the R_2 series of alleles controlling anthocyanin pigmentation in Asiatic cottons is reported.

479. Note on a New Gene affecting Leaf Shape in Asiatic Cottons. By K. Ramiah and B. Nath. (*Curr. Sci.*, **10**, 1941, p. 490. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) In the South Indian cotton variety C_7 (a form of *G. arboreum* var. *neglectum* f. *indica*), which has lobed broad leaves, there has been isolated a mutant, the first one or two leaves of which are nearly normal but the later leaves of which show a progressive reduction of the two lateral lobes resulting in tadpole-shaped leaves, and finally in leaves consisting of only the single middle lobe. In crosses the mutant type behaved as a simple recessive to the normal lobed type, and it was also shown that the new gene pair (*S-s*) is not a member of the *L* series of allelomorphs.

480. The Genetical Behaviour of Three Virescent Mutants in Asiatic Cotton. By C. P. Yu. (*J. Amer. Soc. Agron.*, **33**, 1941, p. 756. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 185.) Three virescent mutants, differing from one another and from the previously reported v_1, occurred in 1935-37 and are described. Data are presented to show that v_1 and v_2 are inherited independently and are complementary factors, and that v_3 and v_4 are independent; v_4 is inherited independently of the genes for anthocyanin pigment, corolla colour, and curly leaf.

[*Cf.* Abstr. **277**, Vol. XVII. of this Review.]

481. Further Studies on the Punjab Hairy Lintless Gene in Cotton. By K. Ramiah and P. D. Gadkari. (*Proc. 28th Ind. Sci. Congr., Benares*, 1941, Pt. III., Sect. Agr., p. 258. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) The gene has been found to affect differentially the viability of the type under different environmental conditions, to disturb segregation for leaf shape, and to affect the growth of the plant according as it is present in heterozygous or homozygous conditions.

482. The Influence of any Internal Genetic Change in a Standard Variety of Cotton upon Fibre Length. By J. H. Moore. (*J. Amer. Soc. Agron.*, **33**, 8, 1941, p. 679. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 471.) Mass-selfed and open-pollinated progenies of a Mexican strain of American Upland cotton were planted for 3 successive years on a field that had grown only Mexican strains. No change was noted in combed fibre length or in its variability or in plant type or seed after 1, 2, or 3 years of mass selfing or open pollination. Arrays on the Baer sorter showed no real differences in fibre-length distribution of ginned staple at the end of four seasons in a comparison of the two kinds of seed stocks with the original seed. Where contamination of seed is avoided, varieties registered or eligible for registration apparently do not run out as measured by fibre length.

483. A História da Evolução dos Algodões Cultivados do Novo Mundo. By S. C. Harland. (*An. Primeira Reuniao Sul-Amer. Bot.* [1938], **1**, 1939, p. 215. From *Pl. Bre. Abs.*, xii., 1, 1942, p. 58.) Reference is made to the transference of the gene for red leaf from a diploid species (*Gossypium arboreum*) to a tetraploid (*G. barbadense*), where it proved to be a new member of an existing allelic series. New World wild diploids of the groups *armourianum*, *Harknessii*, *aridum* and

trilobum have also been shown to possess homology with the tetraploid group. Cytological evidence is adduced in support of the view that these two groups of diploids represent the respective ancestors of the tetraploid New World group. The union is thought to have occurred when there was land connection between the Pacific coast and Malaya, thus probably in the Cretaceous. Relics of other tetraploids have remained on the islands such as Hawaii and Fiji, the only parts of this land connection that have not been submerged. *G. barbadense* was apparently domesticated by the Incas, *G. hirsutum* by the Aztecs, and *G. punctatum* (=*G. Hopi* Lewton) by the North American Indians, the tropical monopodial (tree) forms being the original types. The greatest concentration of genes of *G. barbadense* has been found by the author in the valley of Cauca in Colombia, which is therefore regarded as the probable centre of origin of this species. The corresponding centres for *G. hirsutum* and *G. punctatum* would appear to be southern Mexico; the centre for *G. purpurascens* remains doubtful. This last-named species is thought to have great possibilities for breeding, since it is adapted to an unusually wide range of climatic conditions and has lint of first-rate quality.

484. The Effect of Genetical Factors, Seasonal Differences and Soil Variations upon Certain Characteristics of Upland Cotton in the Yazoo-Mississippi Delta. By J. W. Neely. (*Tech. Bull. No.* 28, Miss. Agr. Exp. Sta., 1940.) During the 4-year period 1935-38 field tests were conducted at Stoneville, Mississippi, to study the effect of genetical factors, seasonal conditions, and soil variations, and their interactions on 15 characteristics of Upland cotton. The cottons comprised 24 strains recently developed for commercial planting in the Mississippi Valley and pertaining to the Acala, Ambassador, Delfos, Deltapine, Express, Missdel, Rowden, Stoneville, and Washington varieties. It was found that differences between strains in regard to each of the 15 characteristics were significant. Yield and earliness characteristics were affected much less by genetical factors than were lint percentage, staple length, boll size, percentage of 5-lock bolls, seed index, and lint index. The effect of seasonal influences upon each of the 15 characteristics was highly significant and predominated over the effect of genetical factors and soil variations in regard to 12 of the characteristics. Staple length, percentage of 5-lock bolls, and seed index were affected more by genetical factors than by seasonal conditions. Soil variations exerted a significant influence on each characteristic, particularly lint percentage, boll size, seed index, and earliness; the effect upon yield characteristics and staple length, although significant, was to a less degree. Environmental factors that increase the percentage of lint might not always be desirable, for sometimes the initial effect is one of decreasing the weight of the seed, and may actually mean a decrease in the amount of lint produced per acre. Staple length and seed index were affected more by genetic than by environmental factors; size of boll and percentage of 5-lock bolls were affected by both groups of factors. Lint index and lint percentage were affected to about the same extent by genetic factors, but lint index was less affected by the environmental factors. Strain differences in regard to earliness, while highly significant, were relatively small. Effects of seasons, however, were very pronounced, and soil effects were highly significant.

485. The Handling of Chromosomes. By C. D. Darlington and L. F. La Cour. (George Allen and Unwin, Ltd., London, 1942. Price 8s. 6d. Reviewed in *Pl. Bre. Abs.*, xii., 3, 1942, p. 202.) This book has been written for teachers and students in schools and universities, but the authors suggest that the fixation and staining techniques described " should not come amiss to workers in the many branches of research for which the handling of chromosomes has now

become useful or perhaps even necessary. . . ." The following are among the more recent techniques described: the use of substitutes such as dioxan, butyl alcohol, tertiary butyl alcohol, iso-propyl alcohol or methylal paraffin oil in dehydration and infiltration for either ethyl alcohol and xylol or ethyl alcohol and chloroform; the use of acetin-orcein and lacmoid indicator (resorcin blue), both these being used in a similar way to iron-aceto-carmine; and the Feulgen staining technique. Incidentally it is now suggested that acetin-orcein should not be used for material stored in 70 per cent. alcohol.

The book contains a preface, twelve chapters, five appendixes, a list of references and an index. It is illustrated by a number of text figures and sixteen excellent plates of chromosome preparations. These plates give a most satisfactory guarantee of the merits of the methods described. After an introductory chapter, the authors discuss equipment (this chapter includes a sensible account of the use of a microscope), living chromosomes, bulk fixation, smears and squashes, paraffin methods, staining and mounting, and special treatments (*e.g.*, those for showing spiral structure). Chapter 9 is called " The Control of Mitosis " and contains very short and rather fragmentary accounts of the actions of X-rays, drugs and temperature treatments on mitosis. The next chapter—its title is " The Control of Fertilization " and its subheadings are pollen germination, tube division, pollen storage, the style, haploid plants, haploid animals—is also rather scrappy. Chapters 9 and 10 include at least two mis-statements. Chapter 11 gives a useful account of methods used in microphotography. Chapter 12—its title is " Describing the Results "—is divided into three sections, interpretation, description, and a section setting out certain rules to be observed in writing papers. . . . The five appendixes deal with sources of material, standard solutions, schedules of treatment, implements, and abbreviations.

486. Cromosômios do Gênero Gossypium. II. Algodoeiro Mocó. By O. C. Góes. (*Arq. Serv. Florest.*, **1**, 2, 1941. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 44.) On the basis of the chromosome number (26 haploid) found in the Moco variety of north-eastern Brazil, the author believes it should be grouped with the American cottons and affiliated with one of the species *G. hirsutum*, *G. purpurascens*, or *G. barbadense*.

487. Preliminary Observations on the Chromosome Morphology in Asiatic Cottons with Special Reference to their Phylogeny and Interrelationships. By K. T. Jacob. (Coimbatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 42.) Previous investigators have reported the presence of two pairs of satellited chromosomes in the Asiatic cottons. The author has invariably found only one pair, while the other pair of nucleolar chromosomes was secondarily constricted. The basic number of somatic chromosomes is inferred to be 7 and on the basis of this the present-day Asiatic cottons are shown to be secondary allotetraploids having the constitution 4*b*-2. On the other hand, the American diploids are inferred to be secondary autotetraploids in that they have two pairs of morphologically similar satellited chromosomes.

488. Cotton Breeding and Genetics. By T. R. Richmond *et al.* (53*rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 74.) Experiments in the accumulation of lint production modifiers in certain smooth-seeded lines were continued during the year. Of the 86 progenies grown from the three most promising families observed last year 77 bred true for smooth seed, 20 of which were uniformly high in lint percentage with an average of over 20. Several of the better lines will be crossed with high-yielding, covered-seeded, normal lines to test the possibility of increasing the lint production in normal stocks with the modifying genes accumulated in the smooth-seeded stocks. A yield trial of 16 first

generation hybrids of *G. hirsutum* and *G. barbadense* was conducted. Hybrids of early maturing Upland types such as Half-and-Half, Stoneville, Delfos, and Nucala with Sea Island gave the best yields, several producing 450 lb. or more to the acre. The open pollinated seeds obtained from the insect pollination tests in which Upland and *barbadense* cottons were arranged in alternate rows in areas frequented by bees, were sown in a ⅛-acre block at the rate of 40 lb. to the acre. As the Upland parent stock carried the gene for red leaf, all of the intermediate red plants in the plat were hybrids and were left at thinning, while the full red-leaf Upland and the green-leaf *barbadense* plants were removed. One phase of the study of species hybrids was an attempt to transfer single characters observed in segregating generations of Upland × *barbadense* hybrids to Upland cotton and to build up lines that, except for a particular character, are essentially Upland in type. The characters, hirsute and petal gland, were recovered from first backcross generations, indicating at least partial dominance. Selfed progeny of these crosses threw individuals in which the expression of both characters was greatly intensified. Other characters recovered in the selfed progeny of backcrosses, but not observed in the initial backcross progenies, were: dark yellow pollen, bright flower bud, scattered boll gland, dwarf plant, and extra carpellary knobs.

[*Cf.* Abstr. **206**, Vol. XVIII. of this Review.]

489. Standardization of Experimental Technique in Cotton Breeding. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 78.) A discussion of the application of statistical principles to the layout of field tests, and the examination of results in progeny row breeding. This involves a considerable amount of labour, but is amply repaid by providing an objective procedure for selection, thereby increasing its effectiveness.

490. Inheritance of Quantitative Characters with Special Reference to Cotton Breeding. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 27.) The questions arising in the effort to secure progressive improvement by selection are closely linked with the study of the genetics of quantitative characters. The paper deals with some of the simpler consequences of Mendelian inheritance applied to quantitative characters, as very little is known about the more complex ones. Heritable variability can be considered as made up of two components, one arising from the additive action of the genes, and the other from their non-additive interactions, and it is the former that is most relevant to selection work. Methods are discussed for separating heritable from non-heritable variance. Crosses between parents differing only slightly may give as much variability as between those with a large difference.

491. Some Considerations in Breeding Cotton for Earliness. By S. J. Patel and D. D. Gopani. (Gujarat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 63.) Owing to the general tendency for the flower buds to shed so long as environmental conditions favour vegetative growth, foreign cottons, which are constitutionally early, fail to show early flowering under Gujarat conditions. Under these conditions extra early maturity in cotton—for the crop to escape frost damage and to grow well under deficient rainfall—can possibly be obtained by evolving quick-flowering strains with shorter bud and boll maturation periods, and by controlling bollworm attacks. From the cultural point of view it has been shown that certain manurial treatments induce early maturity in cotton in Gujarat, and, similarly, cotton following certain leguminous crops in rotation also matures early. A study of the effect of spacing on earliness has been suggested.

492. The Place and Methods of Breeding for Insect Resistance in Cultivated Plants. By R. O. Snelling. (*J. Econ. Ent.*, **34**, 1941, p. 335. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) After some general remarks on the type of organization and worker needed for research on varietal resistance to insect pests, the advances made so far are reviewed under the headings of introduction, selection, hybridization, and grafting.

493. Present Position as regards Breeding for Jassid Resistance in Cotton. By M. Afzal. (Lyallpur.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 54.) None of the reputedly resistant varieties, with the exception of Cambodia, have been found to be resistant to jassid in the Punjab. Among other factors studied it has been proved that as the date of sowing is delayed the injury due to jassid is increased. Spacing experiments have so far not shown any difference in insect population. Sparsely hairy plants have been found which are highly resistant to the pest.

494. Breeding for Resistance to Cotton Root Rot in Gujarat. By G. K. Govande. (*Proc. 29th Ind. Sci. Congr., Baroda*, 1942, Pt. III., Sect. Agr., Abs. 43, p. 217. From *Pl. Bre. Abs.*, xii., 4, 1942, p. 215.) Surviving cotton plants from fields infested with cotton root rot [*Macrophomina phaseoli* (Maubl.) Ashby] showed partial resistance, and continuous selection on this material has given families which show a mortality of only 20-30 per cent. as against 95 per cent. shown by the susceptible variety Broach 9. Their spinning value, however, is very low, and it is proposed to effect further improvement by crosses with other types.

495. Further Studies in Breeding for Wilt-Resistance in Cotton. By B. N. Uppal *et al.* (Poona.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, pp. 157-8.) I. Isolation of Wilt-Resistant Types. Cotton strains and segregates of B.D.8 crosses that had been inbred for several years and grown in wilt-sick soil in the field were found to be highly segregating for wilt resistance in pot culture tests. Selections made in these strains and segregates under conditions of infection approaching the optimum led to the production of types fully resistant to wilt; but the homozygous condition was more rapidly reached in some strains than in others. This is obviously impossible in the field because of the difficulty in distinguishing between plants in which the symptoms of infection may be masked and those showing a high degree of resistance. As the development of wilt resistance in the cotton strains and segregates of B.D. crosses was achieved step by step, it is assumed that it is to be attributed to gradual elimination of modifying factors culminating in the production of full resistance. The elimination of these factors is easily effected under optimum conditions of infection in pot culture but is difficult in the absence of such conditions, as for example in the field. Another point of interest emerging from these results is that selection in pot culture did not yield any immune types. The selected types, though susceptible to invasion by the wilt organism and thus exhibiting symptoms of leaf mottle, did not suffer mortality from wilt even under conditions most favourable for the development of the disease. Such types have been designated as fully resistant or 100 per cent. resistant.

II. A Preliminary Note on the Genetics of Wilt Resistance in Indian Cottons. Results of F_2 and backcross families of *Gossypium herbaceum* crosses showed that resistance to wilt was due to a single genetic difference, whereas in *G. arboreum* crosses this character involved three complementary genes. In all crosses resistance was incompletely dominant. The occurrence of a proportion of fully susceptible plants (*i.e.*, plants that wilted) in the F_1's may be explained on the assumption that the resistant parents are heterozygous for the modifying factors which they carry.

496. Breeding Cotton for Wilt Resistance under Field Conditions. By P. L. Patel and Y. S. Kulkarni. (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 164.) The three important factors influencing the expression of wilt under field environments are rainfall, soil temperature, and the degree of soil infestation by the wilt pathogene. It is possible, to a large extent, to create a uniform spread of the wilt fungus by continuous growth of a 100 per cent. susceptible variety on the same plot for a number of years, and also by adding wilt compost before commencing to test the wilt resistance of cotton strains. It is impossible to regulate rainfall and soil temperature due to vagaries of seasons, and this results in an uneven expression of wilt from season to season. Strains tested in fields under fluctuating seasonal conditions are likely to carry on temporary resistance. Hence the necessity of finally testing them under standard conditions of soil moisture and soil temperature in pots. One backcrossing of the hybrid with the resistant parent appears to be a fairly reliable method to obtain material of better resistance than the straight cross.

497. Progress of Plant Pathological Research in Bombay. By M. N. Kamat. (*Poona Agr. Coll. Mag.*, 33, 1941, p. 97. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 148.) Work of the section during the last fifteen years is briefly reviewed. A special technique for the selection and testing of wilt-resistant types of *Gossypium* suitable for cultivation in the cotton-growing areas of the province is described, and it is claimed that the method has resulted in the production of 100 per cent. wilt-resistant types.

498. Studies in the Physiology of the Broach Cotton Plant. By K. V. Joshi, R. B. Gode and A. K. Shah. (*Sci. Monog. No.* 1, Ind. Cent. Cott. Comm. 609 pp. Bombay, 1941. Price: Rs. 5-8.) The work described in this volume covered a period of nine years from 1923, and was carried out at Surat by a team of workers under the direction of the senior author, whose preface to the report is dated 1933. The text occupies 289 pages, and the remainder consists mainly of tables of data. There is a short appendix of analytical methods, a bibliography and an index. The object of the investigation was to discover (1) the factors governing the shedding of buds and bolls, (2) the relation of shedding to yield, and (3) the measures which could be adopted to keep shedding under control.

The approach was made on a wide front, and only at a late stage narrowed down to questions of nutritive balance, so that the studies provide an account as complete as could be made from many lines of investigation of the behaviour of the plant under the prevailing conditions and in relation to the crop. Accordingly the results have both general and specific interest much beyond that of their bearing on the problem in view.

The account opens with a detailed description of the conditions of crop production and proceeds to describe the development of the cotton plant under these conditions. In this section the extravagance in the inception of the reproductive organs is revealed. On an average 300 flower buds are produced per plant, 76 reach the stage of open flowers, 43 shed as young bolls, and only 30 grow into ripe bolls. A large proportion of shed bolls bear apparently no injury; neither lack of fertilization of flowers nor any parasite is responsible. The spotted bollworm causes considerable injury and loss of crop, but elaborate experiments with protected plants showed that even in its absence shedding is almost as heavy.

Succeeding chapters report on a chemical study of the cotton plant under varied conditions; describe experiments carried out for studying the effects of various treatments on growth and yield, including water supply, plant food supply, and manipulations such as defoliation and disbudding; discuss the influence of the factors governed by the weather and the ways in which they give rise to annual variations in growth.

The final chapter brings together the recorded results and discusses their bearing on bud and boll shedding and its significance in crop production. All are held to indicate and even place beyond doubt the fact that the causes of shedding are nutritional in character, and that shedding occurs as a direct consequence of insufficiency of food in the plant. This deficiency operates primarily in two ways: (1) when the quality of the sap is not conducive to the growth of buds and bolls, and (2) when, though suitable in quality, it falls short in quantity.

(1) During the vegetative phase the ratio of carbohydrates to nitrogen in the leaf sap is at a very low level. In the next stage spells of dry weather and bright sunshine increase photosynthetic activity, the relative concentration of carbohydrates rises and the reproductive phase begins. Fluctuations in the weather of the transition period from the rainy to the dry season cause disturbances of the ratio and consequent shedding. This condition persists until settled weather enables the ratio to remain constant at a higher level, which brings about a greater rate of production and a greater rate of success of reproductive forms. Occasional heavy shedding may still occur if a break in the weather reduces assimilation.

(2) As the number of established flowers and bolls increases they make demands which steadily approach the limit of the quantitative food resources of the plant. Vegetative growth slowly declines and with it assimilatory activity. When this limit is reached no further bolls are able to establish themselves, and all those formed in the closing weeks of the flowering period are shed at one stage or another.

The conclusion is that natural shedding does not lower the yield. At any stage the number of buds, flowers, or bolls on the plant is in excess of its capacity to maintain them. Bollworm damage, on the other hand, may reduce yield as much as 30-50 per cent. It takes a constant toll of established organs and delays compensatory boll-setting into the period when the reduced assimilatory capacity no longer suffices to bring them to maturity.

It follows from the general conclusions summarized above that the retention of a larger number of flowers and bolls, and consequently an increased yield, would follow an increased food supply taken up by the plant, and it is shown that in the Broach cotton area the limiting factor is nitrogen. By maintaining a steady supply of nitrogen at all times the yield of the plant has been raised four- to five-fold, and applications for shorter periods give proportional increases. Forty pounds of nitrogen given in water at an early stage have doubled the yield of seed cotton.

The effect of nitrogen in improving both the retention and development of flower buds and bolls is governed by the stage of growth when nitrogen is made available to the plant. If it is given from the stage of bud development, it increases the percentage success of bolls into flowers; if applied later during the stage of boll development, bolls succeed in larger proportion, and even the yield of seed cotton per boll and nitrogen content of seed are enhanced.

Under conditions of crop production nitrogen has to be applied in one dose during the seedling stage to get the fullest benefit of rain-water to make it available. Experiments have shown that sulphate of ammonia in quantities from 100 to 200 lb. per acre leads to proportional increase of yield of from 20 to 40 per cent. Under the conditions prevailing the value of the increase no more than met the cost of the application, and the need is indicated for sources of cheaper nitrogen to be sought.

499. PASTERNACK'S PARAFFIN METHOD MODIFIED FOR PLANT TISSUE. By K. R. Kerns. (*Stain Tech.*, **6**, 1941, p. 155. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 117.) A rapid method for preparing paraffin sections of plant material. Root tip chromosome counts can be made approximately three hours after taking the root tips.

500. Cotton Roots: Growth in Culture Solutions. By C. Wilson. (*Proc. Assoc. Southern Agric. Workers*, **42**, 1941, p. 209. From *Summ. Curr. Lit.*, xxii., 2, 1942, p. 24.) Sucrose is the best source of carbohydrate for the growth of excised cotton roots, and glucose is next best. Fructose and brown sugar inhibit growth. A good culture solution for the growth of 1-2 cm. root tips at 25-30° C. in the dark, subcultures being made at weekly intervals, consists of $Ca(NO_3)_2$ 190, $CaH_4(PO_4)_2$ 58·5, KCl 48, $MgSO_4$ 73, $Fe_2(SO_4)_3$ 0·9, vitamin B_1 0·1, nicotinic acid 0·5 mg., and sucrose 20 gm., made up to 1 litre with redistilled water.

501. Cotton Plant: Nutrient Requirements. By V. I. Tsivinskii. (*Sbornik Rabot po Biol. i. Fiziol. Khlopchatnika*, 1939, 65-86. From *J. Text. Inst.*, June, 1942, A254.) Experiments on the Russian long-staple cotton No. 8517 show that during the growth of the plant up to budding an abundant supply of P is essential and thereafter the N supply is important. Heavy dressing with phosphates before planting and N fertilization at budding produced rapid growth and a heavy crop.

502. Cotton Plant: Effect of Ammonium Nitrate on Development. By A. A. Lazarev. (*Trans. Dokuchaev Soil Inst.*, **22**, 1, U.S.S.R., 1940, p. 159. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 293.) Ammonia N is not favourable for cotton fertilization on saline soils. With kainite the negative effects on the early development of the plants were not eliminated, but the yield of bolls was higher and the total yield therefore was also higher.

503. Variability of Stand and Yield of Cotton under Field Conditions. By R. J. Kalamkar. (C.P. and Berar.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 130.) Observations indicating the possibility of forecasting the yield of cotton by developing a suitable technique for estimating the number of bolls per plant, plant population per unit area, and the weight of seed cotton per boll.

504. Relative Growth Rate of the Main Stem of the Cotton Plant and its Relationship to Yield. By N. I. Hancock. (*J. Amer. Soc. Agron.*, **33**, 7, 1941, p. 590. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 321.) Plants of Upland cotton varieties grown under field conditions at Knoxville, Tennessee, were studied, 1931-38. Plant height was found to be associated closely with the potential as well as the actual crop of bolls. Measurement of 4,679 plants during 3 years revealed that from 70 to 80 per cent. of bolls were in the vertical fruiting areas nearest the main stem. Shedding mainly took place horizontally along the fruiting limb. The curve representing growth rate of the plant was sigmoid, confirming results of others. The velocity of the growth curve was found most rapid from July 1 to August 5, and the data were fitted by the exponential equation $H=Ae^{kt}$, when written in the linear form. The variable expressing the velocity of this period was associated with yield.

505. Synthetic Ability of Plants as affected by Vernalization. By I. N. Konovalov and T. M. Popova. (*Comp. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, Ser. 31, 1, 1941, p. 58. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 758.) From studies of the accumulation of organic matter, formation of protein per unit time in leaves, and the enzyme activity of the plants, it is considered probable that the acceleration of leaf growth and changes in enzyme activity furnish the main basis for the increased productivity following vernalization.

506. Leaf Albumins as an Index for Salt Resistance of Cotton Plants. By B. P. Strogonov and L. Ostapenko. (*Comp. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, N. Ser. 30, 1941, No. 1, p. 66. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 304.) In the tests reported the protein in the plant tissues increased with the concentration of salts in the soil, as did also the plants' resistance to the salts.

507. COTTON LEAVES: "SILVERING" IN SUN AND WIND. By M. A. DiFonzo. (*Bol. Mens. No.* 72, 1941, p. 303. Junta Nac. del Algodon, Buenos Aires. From *J. Text. Inst.*, March, 1942, p. A116.) Leaves showing patches of silvered or leaden appearance on the back have been observed on cotton plants in positions where they are exposed to the direct action of wind and sun. The discolorations appear to be purely local effects not due to parasites and without influence on the life of the plant. Abnormal exposure of the lower face of the leaf results in rapid and excessive transpiration and transverse folding retards circulation of the sap and disturbs nutrition. Examination of affected parts of leaves shows that the layer of cells of the lower face is separated from the rest of the parenchyma by a layer of air. The silvered effect has been produced experimentally by folding leaves on plants and exposing to direct sunlight. Leaves folded longitudinally acquired a reddish tint on exposure of the lower surfaces in this way, whilst leaves folded transversely acquired first a reddish tint and later a silvered appearance. Folding of leaves in the field may be caused by winds or by damage caused by parasites or other agents.

508. A NOTE ON THE VARIATION IN THE STANDARD FIBRE WEIGHT OF THE COTTON FIBRE IN RELATION TO ITS LENGTH. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 876.) Tables are given showing the observed and standard fibre weights corresponding to different lengths in the strains Co.1 and Co.2 (*G. hirsutum*), and K.546 (*G. arboreum*). In all the three cottons the standard fibre weight systematically increased with decrease in length. In Co.1 and Co.2 the differences between the extreme values of the observed fibre weight per centimetre were 17·2 and 20·2 per cent. respectively. These were reduced to 14·0 and 12·2 per cent. respectively in the standard fibre weight. In the case of K.546, however, the difference of 9·4 per cent. in the observed fibre weight increased to 22·6 per cent. in the standard fibre weight. In the first two cottons, therefore, the variations in the maturity caused exaggerated variations in the fineness among different grades, while in the third they had a masking effect. The studies indicate clearly that the presence of immature fibres has been the cause of the differential behaviour observed in different cottons, in the relationship between the fibre weight and lint length grades, and suggest that the maturity factor may be the cause for the non-variability observed previously in *G. arboreum* and Sakel.

509. A METHOD OF MEASURING THE STRENGTH OF ATTACHMENT OF COTTON FIBRES TO THE SEED AND SOME RESULTS OF ITS APPLICATION. By W. S. Smith and N. L. Pearson. (*U.S. Dpt. Agr. Market Serv. and Bur. Pl. Indus*, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 617.) A simple instrument of the pendulum type and appropriate technique were developed for measuring the force required to detach single fibres from the cottonseed. With it a skilful operator could attain the same accuracy as with a McKenzie single-fibre tester, which was found too time-consuming. When tufts of fibres were pulled from the seed by an apparatus for testing single strands of yarn, figures calculated to represent strength of fibre attachment to the seed for the cotton as a whole, for individual seeds, and for fibres at different positions on the seed were smaller than figures representing the mean strength of fibre attachment obtained by testing individual fibres, and are not considered to be accurate enough for fundamental studies. The strength of attachment of fibres on any given area of any particular seed varied from about 0·25 to about 5·5 gm. The mean strength of fibre attachment varied from area to area on the seed. Fibres on the rounded (chalazal) end of the seed had the lowest strength of attachment and those on the pointed end the highest. A sample of 256 fibres on the side of a seed about half-way between the ends was considered a representative sample for a seed. For

comparing two cottons, at least 10 or preferably 16 seeds, 1 from each of 10 or 16 bolls representing each cotton, are needed. Each seed is taken from the middle of the lock selected to represent the boll. Comparative tests of 41 selected cottons of different varieties and covering a wide range of seed-cotton characteristics showed that very significant differences exist between different varieties. Significant differences were apparent for cottons of the same staple length.

510. Variation in the Measurable Characters of Cotton Fibres. III. Variation of Maturity among the Different Regions of the Seed Surface. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 866.) The present work is an extension of a previous study by the author, and particular attention is devoted to the variation of maturity in the six different regions of the seed surface: the micropylar end, the portion adjacent to the raphe, right side, left side, back of the seed, and the chalazal end. Fourteen pure strains of Indian cotton formed the material for the investigation, and the results are summed up as follows: The micropylar end contains a very high percentage of mature fibres. The maturity at the chalazal end varies considerably in the different strains, in some being as high as 90 per cent. and in others as low as 30 per cent. The maturity for this region, however, is statistically significantly less than that for the other regions in all cases except one (variety Hl back region). Among the other four regions studied—namely, right and left sides, region near the raphe, and the back of the seed—the differences are generally not considerable, and in only four cottons is the maturity of these regions significantly less than that for the micropylar end. In a test with one variety of the effects of manurial treatment it was found that application of manure to a field with rich soil did not have any appreciable effect on maturity of fibres, whilst in a field with poor soil the supply of better nutriment was accompanied by improved maturity. Differences in the nutrition supplied appeared to have negligible influence on the fibre length, weight per cm. and intrinsic fineness.

[*Cf.* Abstrs. **622**, Vol. XI., **740**, Vol. XVI., **229**, Vol. XIX. of this Review.]

511. Diameter of Fibre in Different Strains of Acala Cotton. By G. N. Stroman. (*J. Agr. Res.*, **64**, 4, 1942, p. 243.) Data were obtained on six different strains of Acala cotton to determine the swollen diameter of fibre in each group length from $1\frac{1}{8}$ to $\frac{1}{8}$ inch in steps of $\frac{1}{8}$. The results showed that the shorter lengths had the largest diameters. Measurements of swollen diameter on the $1\frac{1}{8}$-inch length were made on 12 strains from the advanced test in 1938 and 16 strains in 1940 at the New Mexico station, and significant differences were obtained between strains. In 1938 the strain with the largest diameter was N28-5, with a mean fibre diameter of 23·3μ; strain 1450 had the smallest mean fibre diameter, 20·9μ. The difference between the two strains is 2·4μ, whereas 0·8μ would have been significant. Of all the Acala strains tested in 1940 No. 1517 had the largest mean fibre diameter, 23·57μ. Strain 2815 had the smallest mean fibre diameter, 22·10μ. The difference between these two mean diameters is 1·47, which is significant. This indicates that the cotton breeder could breed strains of cotton with small diameters. A significant difference was found among strains in respect to ribbon width and thickness, and significant positive correlation coefficients between ribbon width and thickness were obtained in two of the four strains tested; significant negative coefficients were obtained between ribbon width and number of convolutions in three of the four strains, while between ribbon thickness and number of convolutions a significant negative correlation was found in only one of the four strains.

512. Occurrence of the Dwarf-Red Character in Upland Cotton. By S. C. McMichael. (*J. Agr. Res.*, **64**, 8, 1942, p. 477.) The mutation of Acala-

cotton herein designated as " dwarf-red " originated as a chimera on an otherwise normal green plant. Seeds produced by the chimera were heterozygous for the dwarf-red character. A new type of red-plant colour in Upland cotton is described, and a new type of dwarfing in cotton is discussed which is not recessive in the heterozygous condition. Dwarfing in this type is closely associated with red-plant colour; possibly both expressions are controlled by the same factor. Dwarf-red Acala when crossed with normal green Acala produced an F_2 generation that was intermediate in both colour and plant height between the parental types. The F_2 generation of the cross between dwarf-red Acala and normal green Acala segregated into the 1 : 2 : 1 ratio, inducing a simple monohybrid. Likewise the backcross generations obtained from the crosses made between the F_1 or the heterozygous dwarf-red and the parental types verified the monohybrid condition, both segregating into the 1 : 1 ratio. Indications are that dwarf-red is controlled by a single factor.

513. VERSUCHE ÜBER PFLANZEN-HYBRIDEN. By G. Mendel. (*Züchter*, 13, 1941, p. 221. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 166.) The original manuscript of Mendel's paper is here reproduced.

514. ASYNAPTIC PLANTS OF GOSSYPIUM AND THEIR POLYPLOIDS. By J. O. Beasley and M. S. Brown. (*Genetics*, 27, 1942, p. 131. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 184.) In the F_2 of American Upland (*G. hirsutum*) × Sea Island (*G. barbadense*) cotton, fertile and sterile plants were found in a ratio of about 15 fertiles : 1 sterile. At first metaphase the fertile plants formed 26 bivalents while different sterile plants averaged 6 to 9 bivalents per nucleus. Doubling the chromosome number in the sterile plants failed to restore normal chromosome pairing and fertility.

515. HYBRIDIZATION, CYTOLOGY, AND POLYPLOIDY OF GOSSYPIUM. By J. O. Beasley. (*Chron. Bot.*, **6**, 1941, p. 394. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 140.) Part of this brief review is concerned with work previously published by the author. From chromosome behaviour at meiosis in hybrids it is concluded that the 13-chromosome species comprise five types. The chromosomes of different types have numerous structural differences. All types are more closely related to the Asiatic type (*G. arboreum* L. and *G. herbaceum* L.) than to each other. The Australian (*G. Sturtii* F. Muell), African (*G. anomalum* Wawra. and Peyr.), and American types (*G. Thurberi* Tod., *G. Davidsoni* Kellogg, etc.) are more closely related to the Asiatic type than is the Arabia-India type *G. Stocksii* M. Mast. Haploid-diploid twins such as frequently occur in *G. barbadense* have been found, though extremely rarely, in *G. hirsutum*. The haploids of the latter have a maximum of 5 bivalents. A number of pure lines have been produced by doubling the chromosomes of haploids.

[*Cf.* Abstrs. **542, 543, 559,** Vol. XVII. of this Review.]

516. KONSTANZ UND SYNDESEVERHÄLTNISSE DER POLYPLOIDE. By F. Fagerlind. (*Chron. Bot.*, **6**, 1941, p. 320. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 116.) The newly formed interspecific polyploid is generally considered as a type built up by the true addition of the genoms of the original types. This, however, does not hold if the original parents are allogenomic, which probably explains why many tetraploid species vary so much. The result of chromosome doubling in a hybrid between two species is often constant, but segregation is known to occur. An allotetraploid must be constant, but different behaviour is to be expected from interspecific polyploids that are more or less autopolyploid. Here the possibility exists of inter- or intra-specific combinations, and such hybrids are rarely constant. In an interspecific autopolyploid, crossing-over between specifically different chromosomes is possible, and by this means new chromosome types may be

created. As a result of interspecific syndesis, a segmental interchange between the chromosomes may occur leading to the development of secondary types which lack certain chromosome parts necessary to fertility. This may account for some of the observed sterility phenomena.

517. Interspecific Hybridization and Colchicine-induced Polyploidy in Cotton. By K. C. Amin. (Surat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 39.) Hybrids obtained between New World and Asiatic cottons were all self-sterile, but fertile progenies had been obtained by backcrossing the F_1 to New World cottons. The backcrosses, which were predominantly American, with only a few characters of the Asiatic parents, showed great variability, and selections from these were under trial.

Colchicine treatment of germinated seeds and the growing shoots of young seedlings gave success in inducing polyploidy. The greater the diversity of the genoms concerned in any particular cross among the diploid cottons, the higher was the fertility of the synthetic tetraploid. The effect of chromosome doubling on economic characters was an increase in the length of staple, and there was also a tendency towards thickening of the fibres, which varied in different cases.

518. Die Colchicinmethode zur Erzeugung Polyploider Pflanzen. By B. Györffy. (*Züchter*, 12, 1940, p. 139. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 116.) The literature on the induction of polyploidy by means of colchicine is reviewed and a list is given of the polyploid plants so produced. Arranged according to families, 117 plants are included in the list with the names of the producers.

519. Polyploids in Cotton experimentally produced by Colchicine Treatment. By A. I. Zhurbin. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, 30, 1941, p. 524. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 141.) A male-sterile but female-fertile amphidiploid shoot was obtained by treating a shoot of the hybrid *Gossypium arboreum* var. *neglectum* W. × *G. Thurberi* Tod. with colchicine. Amphidiploids ($2n=104$) have also been obtained by colchicine treatment of germinating seeds of *G. hirsutum* × *G. barbadense*. These amphidiploids were partly fertile. A triploid plant ($2n=78$) was also obtained, but it is suggested that this was due to the union of an unreduced gamete with a reduced one and not to the colchicine treatment.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

520. Cellulose Fibres: X-Ray Structure. By E. Plötze. (*Naturwissenschaften*, **29**, 1941, p. 707. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 304.) X-ray measurements showed that lattice dimensions, orientation and sizes of the crystallites of native fibres of cotton and ramie are about the same as those of low-molecular compounds.

521. Cellulose: Oxidation by Nitrogen Dioxide. (1) By E. C. Yackel and W. O. Kenyon. (2) By C. C. Unruh and W. O. Kenyon. (*J. Amer. Chem. Soc.*, **64**, 1942, pp. 121, 127. From *Summ. Curr. Lit.*, xxii., 7, 1942, p. 165.) A method is described for oxidizing cotton cellulose to a white, fibrous product with great affinity for basic dyes, in which nitrogen dioxide is circulated through the cotton and the nitric oxide formed is allowed to escape through a chilled condenser. The course of the oxidation is judged by determining the carboxyl values of the products. This is done either by shaking the sample with calcium acetate solution and titrating the acetic acid liberated, or by boiling the sample with 12 per cent. hydrochloric acid and collecting the liberated carbon dioxide in a weighed absorption tube. Apparatus is described, and various experiments leading to routine methods for these determinations are also reported. Products

ranging in carboxyl content from 2·8 to 18·6 per cent. are shown in a table that summarizes the results of some 26 runs with various weights of cotton and nitrogen dioxide. Air-dried cotton gave slightly more carboxyl than specially dried cotton. Salts of the oxidized cotton are mentioned. (2) Two other methods for determining the carboxyl content are described, consisting of titrating residual alkali after contact of the sample with dry pyridine or 50 per cent. pyridine mixed with 0·5N caustic soda. Very high copper numbers are recorded for various products. The limiting carboxyl content appears to be about 25 per cent. and residual hydroxyls are shown to be capable of acetylation. Acetyl contents of acetylated oxidized cottons are tabulated. The oxidized cottons yield 9-10 per cent. of formaldehyde in the usual pentosan assay, and the results, taken together, indicate that oxidation by nitrogen dioxide preferentially attacks the primary hydroxyl groups of the cellulose to yield products with combined uronic acid units.

522. Cyanuric and Allyl Cellulose: Properties. Native and Regenerated Cellulose: Differentiation. By R. Haller and A. Heckendorn. (*Helv. Chim. Acta*, 24, 1941, 85E-92E. From *J. Text. Inst.*, June, 1942, A274.) The preparation of cyanuric cellulose by treatment of cotton with alcoholic potash and then with cyanuric chloride in xylene, and the preparation of allyl-cellulose by treatment of cotton with alcoholic potash and then with allyl bromide in xylene, are described, and the products are discussed. The behaviour of the products with swelling agents, iodine reagents, and iodine and sulphuric acid is described, and it is shown that in the cyanuric cellulose only the outer layers are esterified, whereas in allyl-cellulose the entire fibre mass is converted to the ether. This completeness of etherification is attributed to the fact that xylene is a swelling agent for the ether. Both the ester and ether show only small or no affinity for substantive dyes, but it is pointed out that the immunity is relative and dependent on the degree of dispersion of the dyes in aqueous solution. The reduced affinity for substantive dyes is probably due to a change in the surface properties of the fibre as a result of chemical substitution. The desirability of differentiating between cellulose regenerated by saponification of derivatives of native cellulose in which the original fibre structure has been maintained and cellulose regenerated from products in which the original fibre structure has been disturbed—*e.g.*, rayon—is pointed out, and it is suggested that the term "regenerated cellulose" should be reserved for the saponification products of derivatives in which the fibre structure has been maintained. Differences in behaviour with gold chloride solution and with 50° Bé sulphuric acid make it possible to distinguish between native and regenerated cellulose.

523. Cotton: Chemical Treatment and Research. By H. G. Knight. (*Amer. Chem. Soc. News Edn.*, **20**, 1942, p. 581. From *Summ. Curr. Lit.*, xxii., 14, 1942, p. 324.) Scouring, bleaching, dyeing, and finishing processes and the contribution of chemistry to developments in these processes are discussed. The state of the cotton industry in the United States in recent years is reviewed, the need for research is pointed out, and various organizations now undertaking research on cotton are mentioned. Progress made in the study of the physical and chemical properties of cotton fibres, in the development of new and improved cotton products, and in research on chemical finishes is discussed, and directions in which further research is needed are indicated. The work of the Southern Regional Research Laboratory at New Orleans is briefly described.

524. Cotton: Nitration by Nitric Acid Vapour; X-Ray Study. (1) By G. Charpentier and M. Foëx. (2) By M. Foëx. ([1] *C. R. Acad. Sci.*, 211, 1940, p. 468; [2] *Bull. Soc. Chim.*, **8**, 1941, pp. 115, 381, 390. From *Summ. Curr. Lit.*,

xxii., 10, 1942, p. 244.) The course of the nitration of cotton by nitric acid vapour at 35-55° C. and 35-70 mm. was followed by means of X-ray spectrographs. Products with 6·3-13·9 per cent. N were obtained that showed the patterns of both cellulose and trinitrocellulose, the former becoming progressively fainter and the latter stronger with increasing N content.

525. COTTON: VISCOSITY IN DIMETHYLDIBENZYLAMMONIUM HYDROXIDE. By W. W. Russell and L. N. Hood, Jr. (*Ind. Eng. Chem., Anal. Edn.*, 14, 1942, p. 202. From *J. Text. Inst.*, June, 1942, A275.) Apparatus in which it is possible to dissolve cotton in dimethyldibenzylammonium hydroxide in contact with any desired gas is briefly described, and an account is given of a study of the effects of dissolved gas, of stirring in an open system during dissolving, of air and oxygen during dissolving, and of temperature, time, and cellulose concentration, on the viscosity of such solutions. Graphs are given showing the effects of solvent concentration upon viscosity, changes of viscosity with time, and the relation between viscosity and cellulose concentration for unmodified and bleached cotton samples. From the results, conditions favourable for viscosity tests of cellulose quality, with dimethyldibenzylammonium hydroxide as solvent, are drawn up. The desirability of controlling temperature and dissolving time is pointed out. When slightly degraded celluloses (cuprammonium viscosity 25 or greater) are to be analysed the solvent concentration can advantageously be raised to 2·1 to 2·2 N. A cellulose concentration of 0·25 per cent. should give maximum sensitivity in tests on celluloses with cuprammonium viscosities falling between 5 and 43 centipoises. In technical testing a cellulose concentration of 0·35 per cent. may prove most generally useful.

526. COTTON FABRICS: CONSTRUCTION AND WATER RESISTANCE. By P. J. Wood. (*Amer. Dyest. Rpt.*, 31, 1942, p. 6. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 123.) A study was made of 52 different fabrics, including poplins, plain and print cloths, twills, sateens and sheetings. The fabrics, in 40-50 yd. lengths, were kier boiled, bleached, vat dyed, and cut into three. One part was set aside as a check and the other two were treated with two different types of water-resistant finishes. Width, threads per inch, weight and count and ply of yarns were determined before and after finishing, and the treated fabrics were subjected to immersion, spray, impact penetration, rubbing penetration, hydrostatic pressure, and air permeability tests. The test procedures are briefly described, and the results are given in a table and briefly discussed. An instance of difference in water resistance due to difference in yarn count in similar poplin cloths is pointed out. It was found possible to correlate hydrostatic pressure values with the results of porosity tests and also with the results of impact penetration tests. Air porosity tests may therefore be used to predetermine the properties of the finished material even before it is treated for repellency. Impact penetration and abrasion penetration tests reveal the same property of a treated material and represent the nearest approach, under laboratory practice and control, to evaluation of the suitability of various fabrics for severe weather conditions. It is pointed out that the production of a satisfactory fabric requires a judicious combination of proper construction, suitable permeability to air, and satisfactory water resistance of fibres and yarns.

527. EFFECTIVE MILDEW-RESISTANT TREATMENTS FOR COTTON FABRICS. By M. S. Furry and H. M. Robinson. (*Amer. Dyest. Rpt.*, xxx., 20, 1941, p. 504. From *Rev. App. Mycol.*, xxi., 3, 1942, p. 152.) A list of 13 finishing treatments tested by the authors for the control of mildew (*Chætomium globosum*) on an 8-oz. de-greased and de-sized unbleached cotton duck fabric, strips of which were inoculated with the fungus and incubated for a fortnight. Satisfactory

protection was afforded against the fungus; none of the treatments caused any appreciable loss in strength of the fabric, and a few even seemed to increase it.

528. CELLULOSE PARTICLES: FORMATION IN PLASTIDS OF COTTON FIBRE. By W. K. Farr. (*Contrib. Boyce Thompson Inst.*, 12, 1941, p. 181. From *J. Text. Inst.*, April, 1942, A201.) Developing cotton fibres were removed from seeds with extreme care, mounted in filtered juices which had been expressed from other fibres in the same boll, and studied under the microscope. Circular structures of widely varying diameters were faintly but definitely visible in young fibres. They had the appearance of vacuoles filled with clear sap, but closer examination suggested that their contents were more or less dense. When the wall of a fibre was broken with a dissecting needle and the protoplasmic contents allowed to flow out into the mounting medium, the structures were found to be disc-like, not spherical, and their contents not only dense but also granular. All stages of cellulose ring and cellulose particle formation were rapidly identified in the various stages of development of these colourless plastids. The successive stages of ring formation and disintegration reveal the fact that the mechanism of native cellulose particle formation in the colourless plastids of the cotton fibre is essentially similar to the mechanism of mercerized cellulose particle formation in the chloroplast of *Halicystis*. Photomicrographs showing the various stages in the formation of the cellulose particles and their subsequent alignment to form fibrils are given. Photomicrographs showing the formation of starch in plastids of the cotton plant are also given and it is pointed out that the physical aspects of cellulose formation have no apparent points in common with the process of starch formation either in chloroplasts or in colourless plastids in the cotton plant. Within very young plastids, whether colourless or pigmented, no structural features have been observed which will indicate the type of crystalline carbohydrate to be produced. The cells of the leaves, stems, and boll walls of the cotton plant carry on the formation of these two closely related carbohydrates, starch and cellulose, simultaneously, in separate plastids.

529. A STUDY OF OXYGEN ABSORPTION AND CATALASE PRODUCTION DURING GROWTH OF *Chætomium globosum* ON COTTON FIBRE AND YARN. By D. E. Klemme. (*J. Bact.*, xliii., 2, 1942, p. 171. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 288.) At the Bureau of Home Economics, U.S. Dept. of Agriculture, Sea Island cotton fibre and yarn manufactured therefrom were sterilized, inoculated with *Chætomium globosum* (which is stated to have been found on nearly all the samples of awnings, tarpaulins, shock covers, tents, and the like examined in the laboratory of the institution) and incubated for 28 days in a Warburg apparatus. In both materials the daily oxygen consumption reached a maximum at about the 11th day, after which the rate decreased (almost imperceptibly from the 18th to the 28th). Coinciding with the production of perithecia by the fungus, there was a slight fall in the rate of oxygen absorption on yarn between the 5th and 8th days, followed by a renewed increase until the attainment of the peak. The amount of oxygen absorbed by *C. globosum* on the fibre sample was significantly greater than that consumed by the yarn (0·32 milli-equivalents per gm. as compared with 0·21). Corresponding to these differences was a much more extensive output of catalase on the fibre than on the yarn, indicating the superiority of the former as a substratum for the fungus. It was further shown by preliminary experiments that the organisms growing on unsterilized uninoculated samples of Acala cotton fibre consumed a materially larger quantity of oxygen than those present on unbleached cotton fabric, denoting that raw cotton is likely to deteriorate more rapidly than yarn or fabric in a moist atmosphere.

530. Cotton Hull Fibre: Catalytic Hydrogenation. By H. R. Henze *et al.* (*J. Org. Chem.*, **7**, 1942, p. 48. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 310.) When a suspension of cotton batting in caustic soda is subjected to a pressure of 75-85 lb. and then hydrogenated in 7 per cent. caustic soda at 250° and 4,800-5,400 lb. pressure, the cellulose is completely dissolved, yielding a colourless homogeneous solution. Cotton hull fibres (300 g.) react with 8·11 mols. of hydrogen, giving 3·31 mols. of gaseous hydrocarbons (chiefly methane), 0·15 mol. of carbon dioxide and 2·39 mols. of acid material. An ether extract of the neutralized solution may be separated by steam distillation into five fractions: (*a*) b_{754} up to 150°, (*b*) b_{33} 76-96°, (*c*) b_5 75-105°, (*d*) b_5 110-114°, (*e*) $b_{3\cdot5}$ 114-146°. Fraction *d* consists of a mixture of γ- or δ-hydroxycaproic acid and its lactone. Fraction *a* contains acetic acid and either propionic or one of the butyric acids.

531. "Cotton Manufacturing." (Published by The Dominion Textile Co., Montreal, Quebec. Price $4.50. Reviewed in *J. Text. Inst.*, March, 1942, p. 41.) This book gives in an essentially practical fashion a general picture of the manufacture of cotton textiles from the raw material to the loom state cloth. It has been compiled by H. F. Mills, General Superintendent of the Dominion Textile Co., Ltd., of Canada, and W. King, Managing Editor of the *Canadian Textile Journal*, with the assistance of several specialists, mostly from the various departments of the Dominion Textile Co.'s organization, and has been published for the use of students from mills of the Company and its subsidiaries. As it now stands, "Cotton Manufacturing" is a standard textbook for the four-year course on this subject sponsored by the Company for its employees. It contains essential data on basic principles in Opening and Picking, Carding, Combing, Drawing, Fly-Frames, Spinning, Winding, Spooling and Warping, Slashing, Weaving, Cloth Room Machinery, Analysis of Fabrics, Designing, and Economics of the cotton industry in Canada. Although its treatment is from a practical rather than a scientific point of view, it is a welcome addition to the present meagre textile literature. Perhaps mainly in its favour is the fact that in regard to machinery and processes it is completely up to date, and, unlike any textbook known to the reviewer, gives American spinning machinery and practice equal prominence with British. The book is well printed and profusely illustrated, though it may be said that there are rather too many photographs of machines, not always well chosen, and that some of the line drawings are far from good; fig. 4 on p. 115 may be cited as an example of this. In spite of the number of pages (429), the volume is compact and well bound, and in fact just the right size for a comprehensive textbook for the student.

532. Cotton, Mercerized Cotton, and Rayon: Moisture Sorption. By V. C. Shaposhnikov. (*Bull. Acad. Sci. U.R.S.S.* (Classe sci. chim.), 1940, p. 427. From *J. Text. Inst.*, March, 1942, A141.) Cotton was purified by extraction with water, alcohol, and ether; the ash was 0·1 per cent. Rayon was extracted with warm water to an ash content of 0·06 per cent. Mercerization was effected by steeping 10 g. of cotton in 600 c.c. of 30° Bé caustic soda, and repeating the operation until less than 1 per cent. of the fibres appeared under the microscope to have escaped mercerization. The uptake of moisture was measured by passing dry or moist air through the fibre in U-tubes. Values of the moisture content of "natural air-dried" samples were cotton 6·8, mercerized cotton 9·78, and rayon 12·61 per cent.; at saturation the corresponding values were 13·69, 20·54, and 24·95 per cent. Complete saturation of air-dry cotton required 167·5 hours, of mercerized cotton 185·5 hours, and of rayon 220 hours. The average moisture content of cotton, silk, flax, wool and four other types of fibres is about 2 per cent. higher than the Turin standards. It is lowest in May and June and highest in

December and January. An attempt has been made to relate the fluctuation to the climate mathematically.

533. MERCERIZED COTTON: RATE OF HYDROLYSIS. By R. F. Nickerson. (*Ind. Eng. Chem.*, 34, 1942, p. 85. From *J. Text. Inst.*, May, 1942, A237.) The reactivity of mercerized cotton has been measured by determining the rate of evolution of carbon dioxide on boiling a sample (2 gm.) with a mixture (150 ml.) of hydrochloric acid (2·45N) and ferric chloride (0·6M). The samples were prepared by mercerizing folded Egyptian and American yarns after solvent extraction and boiling them in a 2 per cent. caustic soda in the absence of air. After allowing for an "induction period" which is determined from parallel experiments on glucose, the amounts of carbon dioxide evolved are found to be linearly related to a power of the time over a considerable period. The slope for mercerized cotton is steeper than for unmercerized, and mercerization under tension gives slightly less steep curves than mercerization without tension. Velocity constants are calculated from the linear portions of the curves. With the constants for unmercerized cotton as unity they provide "mercerization ratios" that agree with those calculated by other methods, such as moisture regain determinations. The bearing of the work on the structure of cotton cellulose is discussed.

534. COTTON MILL: CLEANING. By E. Hard. (*Cotton*, U.S., **105**, Nos. 9, 10, 12; **106**, No. 1, 1941. From *J. Text. Inst.*, April, 1942, A170.) Practical hints are given on systematic mill cleaning, and a number of simple appliances for securing tidiness and for sweeping and dusting are described.

535. COTTON: EFFECTS OF OILING. (1) By B. I. Pestov. (2) By G. A. Shumilov. (*Khlopchatobumazhnaya Prom.*, **9**, 5, 1939, p. 26. From *J. Text. Inst.*, April, 1942, A170.) (1) Cotton was oiled at the scutcher with 0·37 per cent. of "Verol SK-2" (density 0·866, flash-point 141° C., Engler viscosity 1·71, mechanical impurities 0·01 per cent., water 0·1 per cent., SO_3 0·001 per cent., feeble basic reaction, Al present). Carding was hindered but breaks in spinning were fewer. (2) Dry and moist cotton, differing by 2-3 per cent. in regain, do not require different oiling treatments. Oiling with 0·1 per cent. of transformer oil or 0·1 or 0·3 per cent. of Verol gave good results. The length and regain of the spun yarn were not affected by oiling, but the quality and breaking length were impaired.

536. COTTON PLANT: RECOVERY OF OIL. By E. L. Powell and F. K. Cameron. (*Ind. Eng. Chem.*, **34**, 1942, p. 358. From *Summ. Curr. Lit.*, xxii., 9, 1942, p. 219.) The recovery of oil from whole cotton by solvent extraction is discussed, the term "whole cotton" being used to connote plants grown under forcing conditions of close planting and harvested by mowing the whole plant after it has attained a maximum content of oil and cellulose. Objectionable colouring matter in the stems and cusps can be removed from the whole cotton by aqueous solutions of sulphides and sulphites. After such treatment, organic solvents extract the oil in a form which is easily bleached by standard adsorbents. A refined oil can be obtained which meets standard specifications and the requirements of the American market.

537. COTTON PLANT AND WOOD: CELLULOSE CONTENT. By W. H. W. Chen and F. K. Cameron. (*Ind. Eng. Chem.*, 34, 1942, p. 224. From *J. Text. Inst.*, May, 1942, A210.) Cellulose analyses are reported for parts of the cotton plant and for various timbers of the South-eastern States. The cotton plant is composed roughly of lint 24 (24), seed 36 (5·6), cusps 20 (8), and stems 20 (8) per cent.; the "total cellulose" of the plant is distributed as shown by the percentages in parentheses. The *a*-cellulose content of the total cellulose is higher in the cotton plant than in the timbers.

538. Cotton Pulps: Modification by Oxidizing and Hydrolysing Agents. By D. M. Musser and H. C. Engel. (*Paper Tr. J.*, 114, TAPPI, 1942, p. 173. From *J. Text. Inst.*, July, 1942, A343.) A report of a study of some papermaking properties of cotton pulps degraded by treatment with aqueous permanganate, neutral hypochlorite, and hydrochloric acid solutions. Reduction of the cuprammonium specific viscosity of cottonseed hull fibre to a value below 10 facilitates beating. Linters and lint cotton would probably behave similarly. With pulps degraded to the same cuprammonium viscosity, the physical properties of handsheets appear to be affected less by oxidizing agents than by acids. These effects are discussed in relation to fibre structure.

[*Cf.* Abstr. **268**, Vol. XIX. of this Review.]

539. Internal Reconstruction in Cotton Spinning. By R. H. A. (*Text. Mfr.*, lxviii., 810, 812, 1942, pp. 219, 320.) Part I stresses the urgent necessity for improvements in processing efficiency and conditions of working in cotton mills in order that Lancashire may maintain and expand its export trade in the post-war period. Two recent improvements in the mixing and blowing rooms are dealt with in some detail: stack mixing and single process lapping. Part II discusses suggested schemes for conversions of plant in a typical case.

540. Spinning Mill Labour-saving Devices. By B. Robinson. (*Text. Wkly.*, 29, 1942, p. 470. From *Summ. Curr. Lit.*, xxii., 9, 1942, p. 199.) A summary of a lecture on recent machine developments that offer the prospect of reducing the number of processes and operatives in cotton spinning. Special attention is paid to the contributions of the Shirley Institute, such as the Pneuopener, the Lint Recoverer, and "short process" spinning.

541. Spinning Problems: Discussion. Southern Textile Association. (*Cotton*, U.S., **105**, 12, 1941, p. 88. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 113.) A report of a discussion of the effects of increasing card cylinder speeds, methods of introducing new employees to their work, training classes for employees, improvements in yard per yard evenness produced by blending reserves on scutchers, relative humidity in high draft spinning, and the inspection of new bobbins and quills. Test results showing increases in production and in yarn strength as a result of increasing card cylinder speeds from 172 r.p.m. to 196 r.p.m. and from 165 r.p.m. to 192 r.p.m. are quoted. It was pointed out that a lower relative humidity is required with high draft than with regular roving. Methods of controlling humidity were briefly discussed and the need for air conditioning was stressed. The use of a machine running at a speed of 1,100 r.p.m. for testing bobbins for balance, and also of gauges and a jig for testing the size of bobbins, was reported.

542. Textile Education and Recruitment. (*Text. Wkly.*, **29**, 1942, pp. 666, 668, 698, 700, 707. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 317.) A report is given of a Conference on "The Future of Technical Education for the Textile Industry" held on June 6 at the Oldham Technical College. The history of the industry was briefly reviewed and the present unsatisfactory conditions discussed by A. C. C. Robertson, who suggested that cotton operatives should be engaged on a yearly basis of payment for all jobs in the mill which have well-defined operation. J. Millward pointed out that, given post-war reconstruction based on the reopening of world trade by lasting coöperation, the cotton industry could confidently look forward to stability, exports, regular employment, reasonable working conditions and wages commensurate with those in other industries, which factors should ensure a steady flow of new entrants to the mills. He also pointed out that, in order to make the best type of workman, youths should enter the spinning trade at a reasonably early age

(below sixteen). Mr. E. Raymond Streat advised a break with the past and a planned policy of production and progress based on new, bold lines. He recommended the modernizing of the industry and pointed out that the Cotton Board believes that the industry can be made prosperous by a policy based on a wise system of price management, coupled with sound Government trade policy at home and abroad, and with schemes of trade promotion and technical progress on the basis of constant research. He stressed the need for scientifically trained men, and classified young people entering the mills into three groups: (1) young people who will be operatives and get the required training in the mills; (2) ambitious young operatives who intend to equip themselves as overlookers, foremen, mill managers, etc., who will require a background of sound technical education; and (3) the fully trained scientist—the textile technologist proper—who should have a university degree. Discussing the education of these groups, Mr. Streat suggested that there may be too many so-called technical institutions in Lancashire, and that every technical school or institution should be part of a county-wide scheme, playing its allotted part. Other speakers suggested promotion based on technical education and real merit rather than on seniority and name, coöperative control in the industry, good equipment in technical schools, and travelling scholarships.

543. The Microscope in Textile Analysis. By W. O. Holme and F. J. Munoz. (*Rayon Text. Mo.*, 22, Nos. 1, 2, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 280.) The many uses of the microscope in the textile laboratory are noted, and the discussion is concerned with the accessories required; the minimum, optimum, and optional equipment; the preparation of specimens; the proper instrument technique; the measurement of diameter; the advantages of projection; and projecting arrangements.

544. Maintaining Constant Humidity. Automatic Laboratory Device for Use in a Closed Chamber. By C. Nanjundayya and N. Ahmad. (*Text. Wkly.*, 23/1/42. From *Cott. Lit.*, March, 1942, p. 96.) The device is stated to be specially useful in a laboratory either for conditioning samples at known humidity or for taking measurements on samples which require to be kept in an atmosphere of constant humidity over long periods.

545. Cotton Yarns: Testing. By D. F. Kapadia. (*Ind. Text. J.*, 52, 1942, p. 109. From *Summ. Curr. Litt.*, xxii., 16/17, 1942, p. 383.) Previous work is reviewed and a comparative study is made of lea, single-thread, and ballistic testing methods. The lea test is shown to be of an inferior order compared to the other two, and it is pointed out that there is not much ground for regarding the single-thread test as being liable to considerable sampling error, if its measurements are expressed as count-strength product and a correct sampling procedure is employed. The ballistic test is shown to be the most significant. For the purpose of testing with reference to a spinning test it is suggested that tests should be made on ten bobbins. The total length of yarn on each bobbin should be considered as made up of five parts and from each part, subject to a random order within it, samples should be drawn for one lea, one ballistic and ten single-thread tests. In this way a reliable estimate made up of fifty lea, single-thread, and ballistic count-strength measurements will be obtained. It is shown that there is no advantage in calculating the statistical values of such quantities as (*a*) yarn-strength irregularity percentage, (*b*) weakness percentage of single-thread tests, and (*c*) spinning breaks, without a knowledge of standard magnitudes of these quantities to guide judgments of yarn strength and quality. Limiting magnitudes of these quantities are derived and explained with reference to spinnings in different standard counts and to spinning values. A laboratory

spinning test technique is described which is capable of giving spinning values of cottons from spinnings in two standard counts. Results obtained with Indian cottons of different varieties and seasons are discussed.

546. COTTON YARNS: LOAD TO STRAIGHTEN. By H. J. Ball. (*Text. World*, **92**, 3, 1942, p. 86. From *Summ. Curr. Lit.*, xxii., 11, 1942, p. 259.) A method of determining the load necessary to straighten, but not stretch, a single cotton yarn which has been unwound from a bobbin, is described.

547. A THEORETICAL APPROACH TO THE PROBLEM OF YARN STRENGTH. By R. R. Sullivan. (*J. App. Phys.*, March, 1942. From *Cott. Lit.*, April, 1942, p. 136.) "An idealized yarn, composed of fibres with specified properties, is treated analytically with the aim of determining the yarn strength at any degree of twist. The results are presented in the form of equations and curves which relate the yarn strength to the fibre properties and the degree of twist. Two cases are studied: (1) all fibres alike; (2) fibre properties variable from fibre to fibre. In the latter case the mathematical expectation of the yarn strength at any yarn cross-section is obtained. It is found that the optimum twist multiplier is largely determined by the fibre length, fibre fineness, and coefficient of friction, whereas the maximum yarn strength (corresponding to the optimum twist multiplier) is more strongly dependent upon the intrinsic fibre strength than upon the other fibre properties studied."

548. COTTON YARNS AND CORD: TREATMENT TO IMPROVE STRENGTH. United States Rubber Co. (New York.) (B.P. 545,716 of 3/2/41: 9/6/42. From *Summ. Curr. Lit.*, xxii., 15, 1942, p. 351.) A process for improving the tensile strength of yarn or cord composed of cotton fibres comprises subjecting the natural waxes on the cotton fibres to treatment with a water-soluble wax-emulsifying compound which has a retaining action on the natural waxes, permitting the resulting compound to remain on the cotton, and stretching the yarn or cord to an extent just short of the breaking point. The wax-emulsifying compound is preferably selected from the class consisting of alkali metal salts of alkylated aromatic or hydro-aromatic compounds containing functional acidic groups which render them soluble in aqueous alkali. The treatment may be applied to tyre cords which are subsequently treated with rubber latex.

TRADE, PRICES, NEW USES, ETC.

549. THE WORLD DEMANDS A SOUND COTTON POLICY. By A. B. Cox. (*Text. Business Rev.*, March, 1942. From *Cott. Lit.*, May, 1942, p. 154.) About 95 per cent. of the world's cotton is normally grown in six countries—United States, India, Russia, China, Brazil and Egypt—whereas about 70 per cent. of the world's 147,000,000 cotton-spinning spindles are in Great Britain, Germany, France, Italy, and other European countries, and Japan, which all together grow less than 1 per cent. of their raw-cotton requirements. The tremendous significance of the problems of international relations caused by this separation of cotton manufacturing from cotton growing becomes evident when it is realized that the trade in raw cotton, semi-finished, and finished cotton goods together constitutes the largest unit in world trade.

550. COTTON STATISTICS. By J. A. Todd. (*Text. Manufr.*, lxviii., 1942, Nos. 808, 809.) The thirtieth paper of this series (April, 1942) discusses important developments during March affecting the raw cotton section of the Lancashire cotton industry. The cotton position in the United States, India, Egypt and South America is also discussed. Tables are included giving Cotton Prices in New York and Bombay weekly from September 6, 1941, to March 28, 1942, and

the Monthly Consumption of all cottons in the United States from August to February for the seasons 1939-40 to 1941-42.

The next article (May) deals briefly with the process of rationalization among raw-cotton merchanting firms. Developments in the United States, India, Egypt, South America, and the purchase of the African cotton crops by the British Government, are discussed. The two tables included give the Cotton Prices in New York and Bombay weekly from September 6 to April 25, and the Government Forecasts of the Indian crop from August to April for the seasons 1937-38 to 1941-42 inclusive.

551. COTTON SUPPLY AND MARKETS. By J. A. Todd. (*Text. Mnfr.*, lxviii., 1942, June, and subsequent numbers.) This is a new series of articles giving month by month a review of the cotton situation at home, and in the United States, South America, India, and Egypt. The most recent article (September) states that in the home section releases of long staples—Egyptian, Sudan, and East African—continue in excess of the restricted demand from fine spinners, and a good proportion of recent arrivals have been delivered into the Control's reserve stores. War and shipping uncertainties make it difficult to predict the character of raw cotton imports during the present season, but it would seem reasonable to anticipate a total import of rather more than 2,000,000 running bales. Prospects are that almost the whole of the West African, French Equatorial, and Belgian Congo cotton crops will again be shipped to the United Kingdom. The " Care and Maintenance " scheme drawn up by the directors of the Liverpool and Manchester Cotton Associations has received Government approval and is to be put into operation with a minimum of delay. Under the scheme, firms and group units employed as Controller's handling agents will pay commissions and fees received from the Control into a central fund for redistribution to the raw-cotton trade as a whole. By this means it is hoped to maintain in being the basic structure of the cotton market for ultimate post-war reconstruction. In contrast to the situation ruling a few months ago yarn production in Lancashire is now running in excess of manufacturers' needs. Business in the Manchester yarn and cloth markets during the month of August has been moderately active. Export trade has been largely confined to the filling of the West African allocation for the current quarter and to a few Government-sponsored orders for the Dominions. . . . Prospects are that production of both yarn and cloth in Lancashire will be fairly well stabilized at around the current level through the autumn and winter months.

United States.—Price fluctuations in the American cotton markets during August have been narrow and indecisive. In Washington farm legislation has been kept in the background mainly for domestic political reasons. An ideal growing season, coupled with liberal fertilization of the best cotton land, gives every prospect of record high yields of good-quality cotton. July consumption of all kinds of cotton by the U.S. mills was officially returned at 995,000 bales, bringing the total for the 1941-42 season to 11,172,000 bales, of which approximately 11,000,000 bales were American cotton. Total consumption during the present season is generally expected to be at least 12,000,000 bales.

Egypt.—The current cotton crop is estimated between 400,000 and 500,000 running bales, compared with an approximate output of 1,150,000 bales in 1941. Most of the export of around 650,000 bales went to Great Britain, though fair shipments were made to India and the United States. Stocks in Egypt on August 1 last totalled about 1,300,000 bales, the great part of which was held by the Anglo-Egyptian Buying Commission.

India.—Domestic politics have overshadowed the Bombay cotton markets during the past months, prices breaking by Rs. 40 per candy when the outbreak of

civil disobedience became imminent. Monsoon and crop news have continued generally favourable. The total acreage under cotton is estimated at 15-20 per cent. less than last year owing to much reduced sowings of short-stapled varieties.

South America.—Estimates of the 1941-42 Argentine crop are now given at 350,000 bales as a result of a favourable harvesting season. Establishment of higher Government loan rates and a reduction in estimates of the current Brazil crop to 1,350,000 bales have stimulated a further advance in São Paulo cotton prices, the quotation for type 5 rising to 66 milreis per 15 kilos. About half the 1941-42 Peruvian crop of around 280,000 running bales has already been marketed through normal commercial channels. Prices in the Lima market advanced following a Government decree providing for a 30 per cent. reduction in the 1942-43 cotton acreage.

552. Research in U.S.A. to Increase the Use of Cotton—a Symposium. (*J. Home Econ.*, **32**, 7, 1940, p. 443. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 571.) The following papers are presented: Cotton Fabric Research in the Bureau of Home Economics (R. O'Brien); Domestic Utilization of Cotton in Relation to Economic Conditions in the South (R. J. Cheatham); The Importance of Chemical Finishing in Increasing the Consumption of Cotton Textiles (W. M. Scott).

553. Low-Grade Cotton: Use for Paper. By E. O. Reed. (*Amer. Dyest. Rpt.*, 31, 1942, p. 24. From *J. Text. Inst.*, April, 1942, A180.) Cotton by-products such as hull-shavings and the waste from ginning, carding and other cotton-cleaning operations can be made suitable for the production of fine bond and writing papers by boiling with sodium chlorite and then bleaching. Paper equal to the best from cotton rags has been obtained in this way.

554. Sewing Cotton: Use for Stitching Wounds. By W. H. Meade and C. H. Long. (*Sci.*, **95**, No. 2462, Suppl. 12. From *J. Text. Inst.*, June, 1942, A259.) Ordinary sewing cotton can replace silk in sewing up all types of wounds requiring interrupted stitches. During a period of eighteen months cotton has been used for this purpose in approximately 1,800 cases at Charity Hospital, New Orleans. Cotton was tolerated better by body tissues than silk, and can be used more safely in the presence of infection. Dry, unsterilized cotton has a lower tensile strength, count for count, than catgut, silk or linen, but is less weakened than these by sterilization.

555. Cotton Thread: Application in Surgery. By H. Taubenschlag. (*Bol. Mens.* No. 75, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 601. From *J. Text. Inst.*, April, 1942, A171.) Disadvantages of catgut for use in surgery and experiences with other materials are discussed. Tests have shown that silk and cotton threads produce less œdema and inflammation than catgut and linen thread, and that these effects disappear most quickly when cotton thread is used. Satisfactory results with sterilized cotton thread in various operations are reported. The use of fine thread and needles is recommended.

ADDENDA.

556. Uganda. Conference on Rural Betterment. (*Rpt. and Proc. of Conf. on Rural Betterment*, 1941, recently received.) This Conference, held from May 7 to 10, 1941, was arranged to enable those working on rural betterment to have an opportunity of discussing the various aspects of the work and to consider the many practical problems that have arisen from time to time. Officers of the Provincial Administration as well as of the Agricultural, Forestry, Medical and Veterinary Departments attended the Conference.

The Director of Agriculture, in his opening address on "General Problems concerning Rural Betterment," described briefly the work that had been done

in connection with rural reconstruction. There had been great developments in recent years in the work of the technical departments, but difficulty was experienced in applying the results to the progress of the rural African communities. The need was pointed out for a class of trained Africans of proved character, integrity, and ability to lead others, who could pass on to the rural communities the simple lessons on such matters as strip cropping, diagnosis of cattle disease, prevention of overcutting of timber supplies, better housing, improvement of village water supplies, etc. The Conference agreed that this class of rural worker was desirable, and the question of the recruitment and training of Africans considered suitable for the purpose, who might be given some such title as Rural Assistant, was fully discussed.

Several other useful papers were read and discussed, and abstracts of some of them are given below.

In closing the Conference the Director of Agriculture expressed the hope that it would be possible to organize further Conferences, possibly on an annual basis, since the interdepartmental discussions were of very great value to all concerned.

557. Problems of Rural Reconstruction in Teso. By A. L. Stephens. (*Rpt. and Proc. of Conf. on Rural Betterment*, Uganda, 1941, p. 4.) A five-year plan has been instituted to introduce strip-cropping with permanent grass strips on the contours. The Teso native recognizes the benefit of manuring but always raises the objection of the labour involved, especially as the cattle remain relatively concentrated while cultivation has been dispersed. Any changes must be gradual and evolve as naturally as possible as developments of the previous methods.

558. Extension Propaganda. By T. E. Hayes. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 7.) Deals with the organization and methods of rural propaganda addressed to Uganda peasant farmers.

559. Aspects of the Maintenance of Fertility in Overcrowded Areas. By C. E. J. Biggs. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 12.) Deals mainly with areas in which holdings are in many cases not large enough to allow of land under annual crops being rested three years under grass. The worst areas are being subjected to overcropping with cotton and maize, which is now inducing sheet erosion in a soil which was originally highly fertile and resistant to erosion. Recourse may have to be made to bunds planted with grass to slow down erosion until research has provided a means of restoring fertility. When a minimum standard of fertility has been reached cotton will go on producing a crop indefinitely. Shorter periods under grass may be found effective, and mineral nutrients might be supplied by the ash from seed burnt at the ginneries. Stall feeding of cattle on elephant grass for the production of manure should be tried.

560. Gully Erosion. By G. B. Masefield. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 18.) Almost all gully erosion in Buganda arises from run-off from roofs and bare compounds, and from boundary ditches, footpaths, and roads. Methods are discussed of arresting the operation of these causes, and of dealing with gullies already formed by the use of elephant grass or earth dams planted with grass.

561. Practical Problems in Connection with Strip Cropping. By R. K. Kerkham. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 15.) Describes the system of strip cropping laid out at the Serere Farm and some of the difficulties which would be involved in its wider adoption. The most serious appears to arise in the grazing of cattle, which might be met, at the expense of some loss of

land, by live hedges. An objection continually raised by natives is the greater facility offered for theft and the depredations of animals.

562. ANIMAL HUSBANDRY. By C. F. Clay. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 20.) Deals with the place of livestock in native agriculture in Uganda under the headings: breeding, grassland management, supplementary feeding, housing, and the utilization of manure. The conclusion was reached after discussion by the Conference that improvement in the management of stock must precede advances in breeding. There is plenty of room for improvement by selection, but the disease factor is of such prime importance that this should be carried out under veterinary supervision. Stall feeding in Buganda for manure and meat should be investigated.

ERRATUM.

REPORT OF THE AGRICULTURAL RESEARCH STATION, SUDAN, 1937-38, Vol. XVIII., Abstr. **297**, p. 85. The sentence beginning on line 14 is incorrect and should read as follows: "In rotation experiments the inclusion of dura in a rotation had a depressing effect on subsequent cotton yields. The best yields were obtained with a cotton-lubia (*Dolichos*)-fallow rotation."

THE EMPIRE COTTON GROWING REVIEW

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Printed in Great Britain by
Billing and Sons Ltd., Guildford and Esher